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US Department of Energy | Privacy & Security Notice

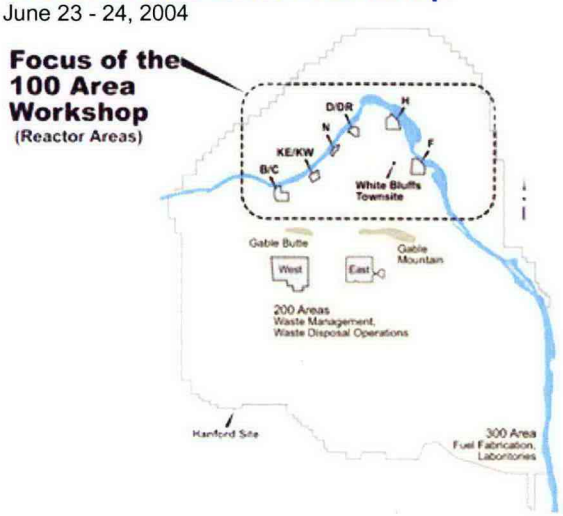
Hanford Site End State Vision

DOE/RL-2005-57

Interagency Management Integration Team (IAMIT) Charter
Public Involvement Schedule
Public Workshop Outcomes
June 23 - 24, 2004
August 10 - 11, 2004
May 19, 2005
Background Material
Submit Comments/ RBES Mail Box
End State Vision
Hanford Site End State Vision Home
Hanford Home Page

100 Area End State Workshop

June 23 - 24, 2004



This first in a series of three workshops to help clarify a vision for the Hanford Site began with a presentation by Roy Gephart, a groundwater hydrologist with the Pacific Northwest National Laboratory, an author and recognized expert on Hanford. The presentation, An Introduction to Hanford, provided an overview of Hanford, including the contaminants located at the Site.

- Meeting Agenda
- Subject of Each Breakout Session:
  - 100 Area land use activities
    - Discussion Questions
    - Graphics
    - Summary of notes taken
    - Verbatim bulleted notes
  - Reactors
    - Discussion Questions
    - Graphics
    - Summary of notes taken
    - Verbatim bulleted notes
  - River pipelines, groundwater and riparian zone
    - Discussion Questions
    - Graphics
    - Summary of notes taken
    - Verbatim bulleted notes

At the end of the workshops, participants were asked again to write down comments on any aspect of the workshop, particularly lessons learned. You will find these comments in two forms:

- Comment matrix
- Comment summary

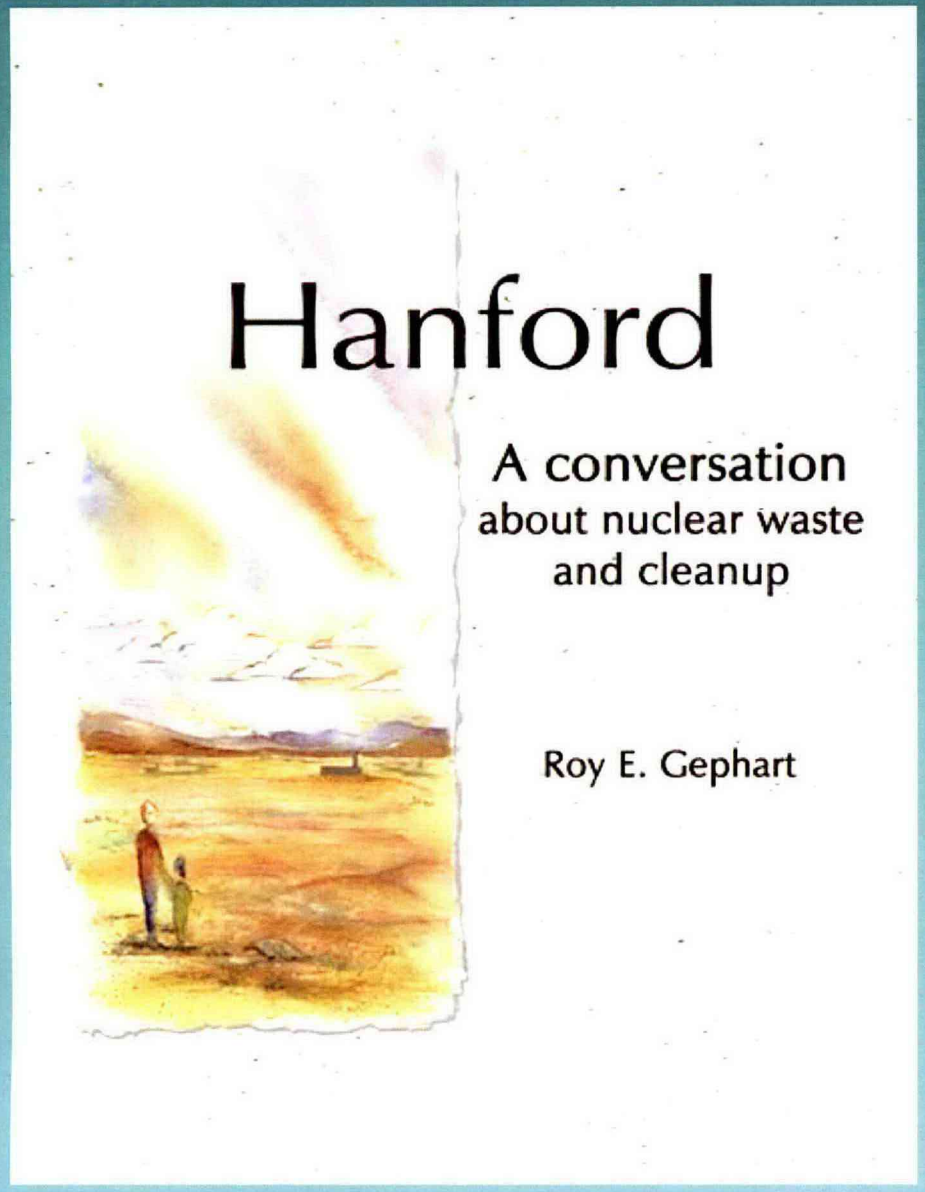
At the 100 Area workshop, DOE promised to post on the web the revisions made to a document called the Hanford Site Risk-Based End State Vision (a document required from each site by DOE Headquarters), that were a result of the public input received at this workshop.

For questions or comments, please send a message to RBES@rl.gov
URL: http://www.hanford.gov/docs/rbes/6-23.CFM
Last Updated: 07/19/2010 14:02:22

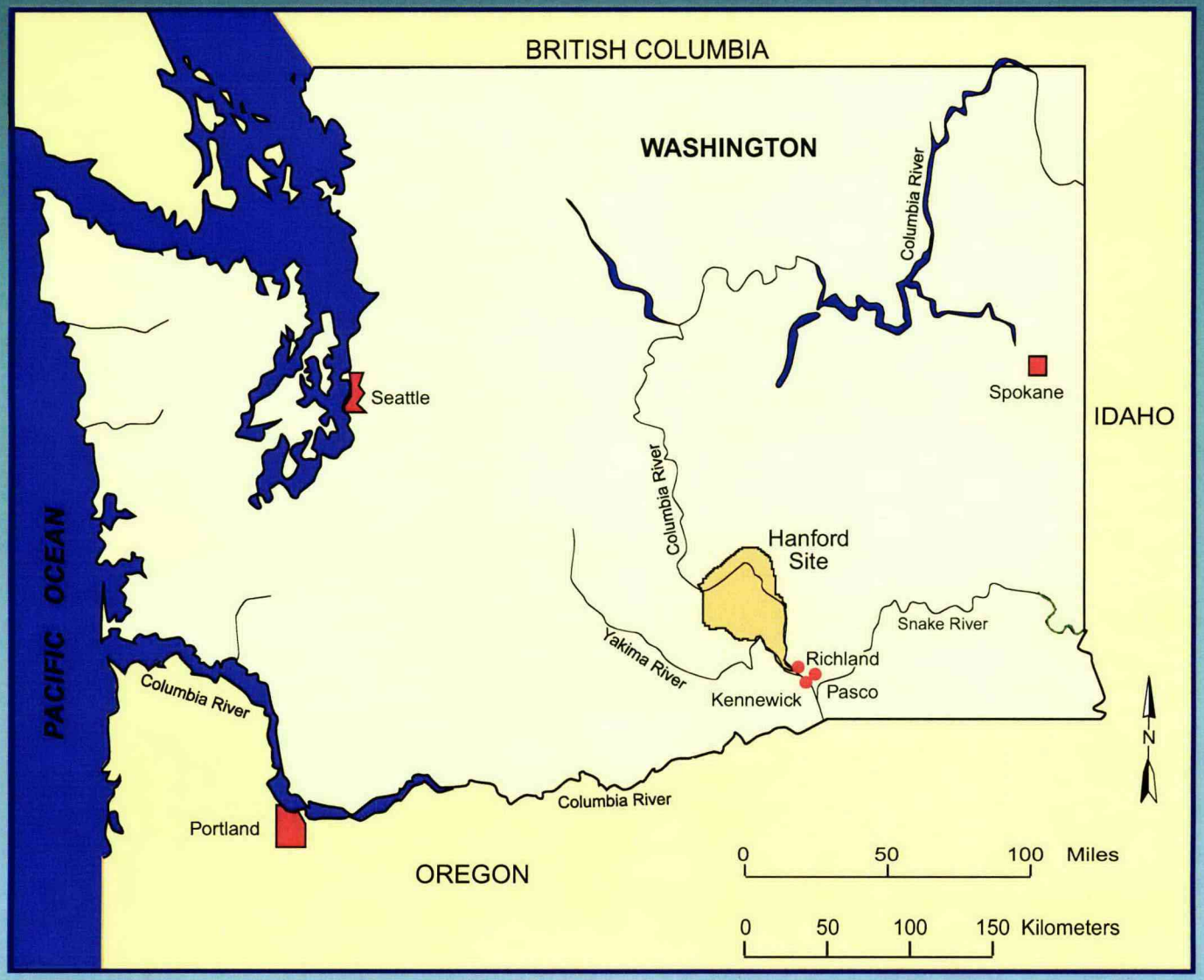
An Introduction to Hanford

Roy E. Gephart

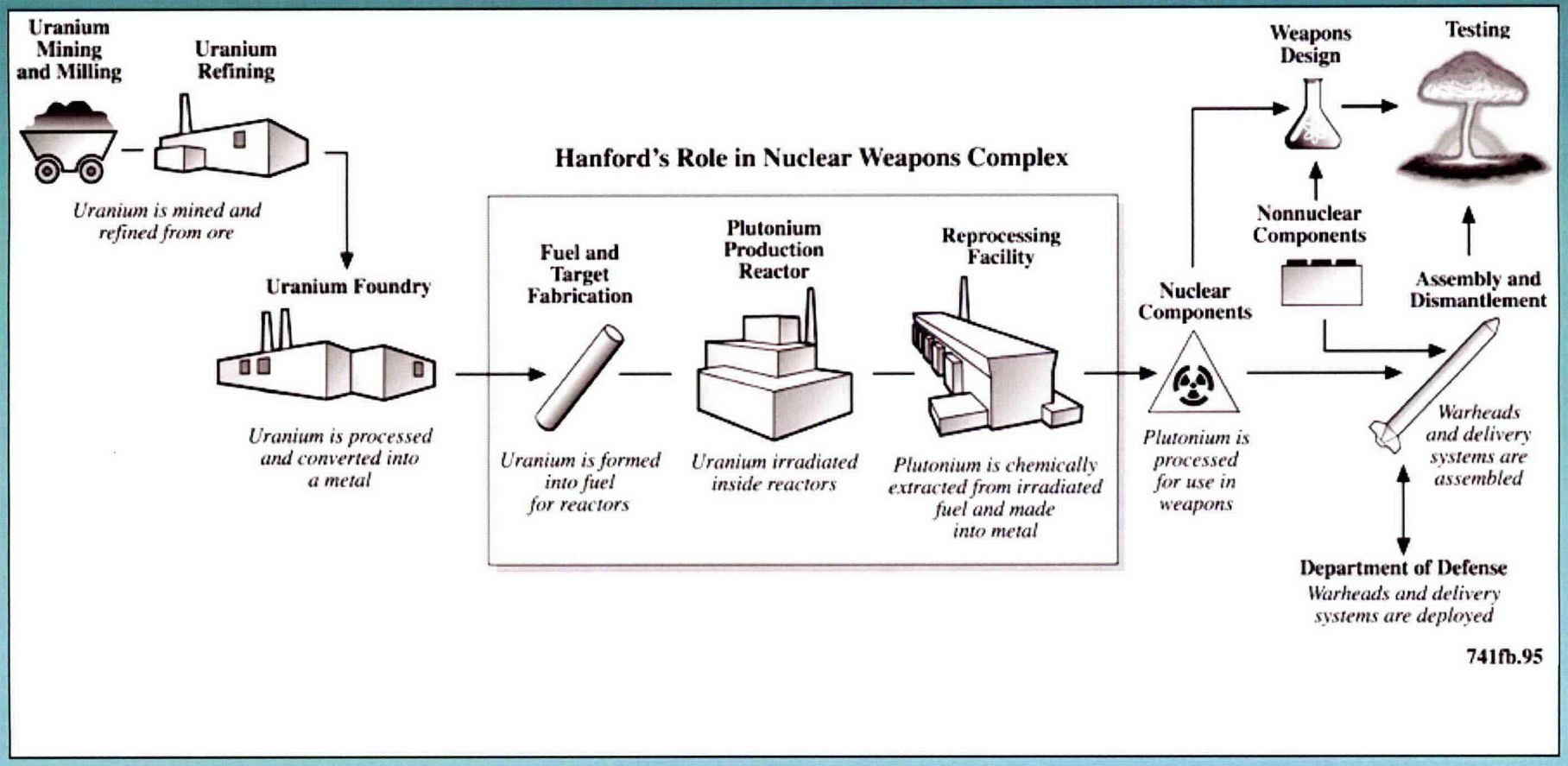
Pacific Northwest National Laboratory
Richland, Washington

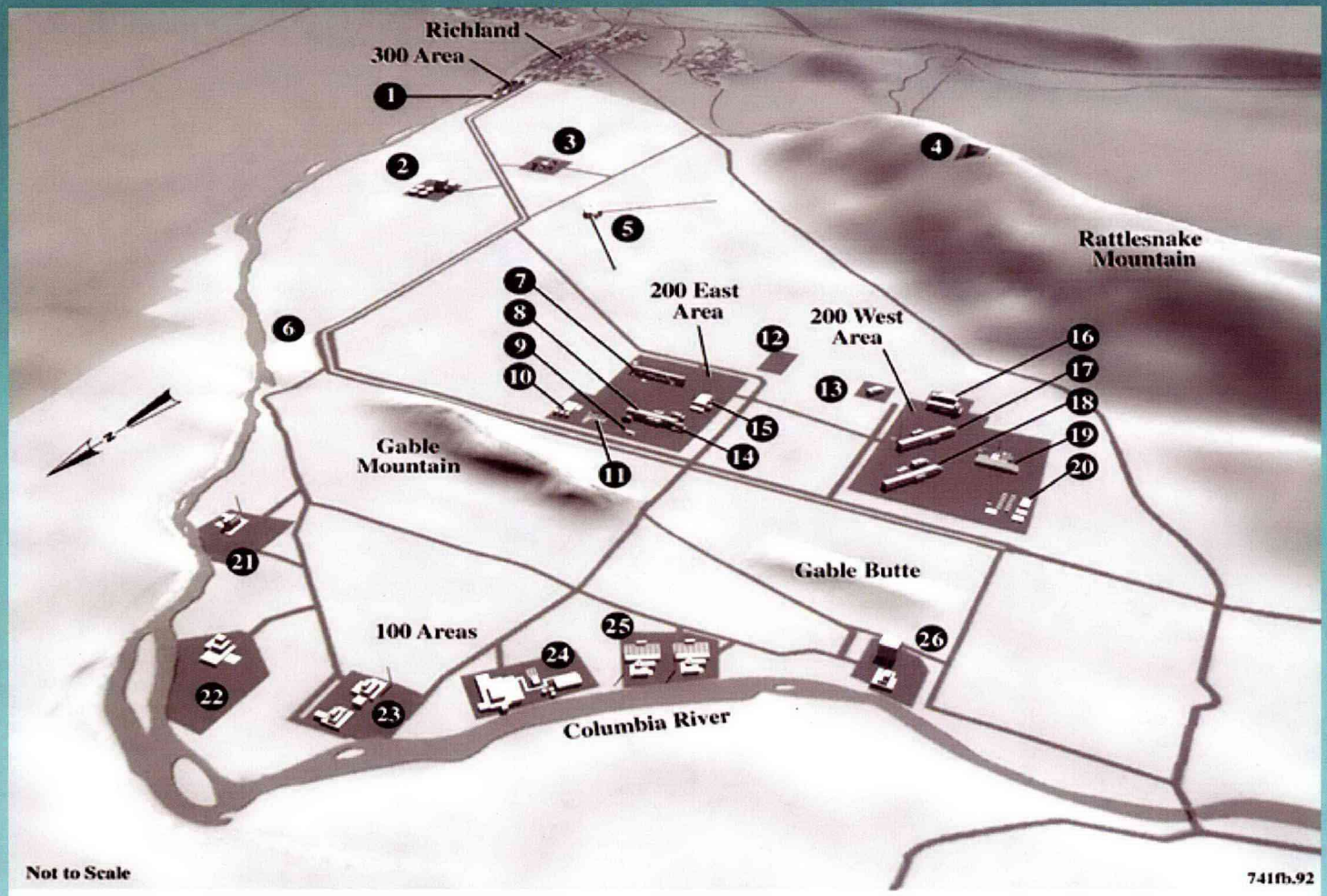


Most photos, illustrations, and numbers given in talk are taken from this book available at local libraries.


BRITISH COLUMBIA
WASHINGTON
IDAHO
OREGON
PACIFIC OCEAN
Columbia River
Columbia River
Columbia River
Columbia River
Seattle
Spokane
Hanford Site
Yakima River
Snake River
Richland
Kennewick
Pasco
Portland
N
0 50 100 Miles
0 50 100 150 Kilometers

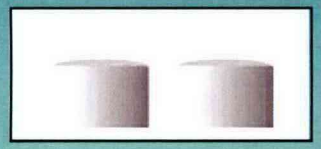
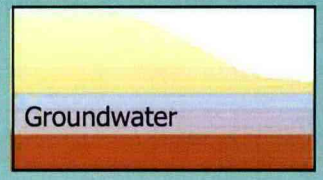
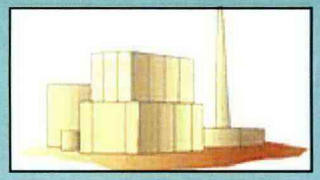
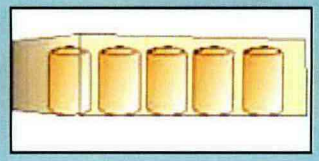
Past Mission of Hanford





1. 300 Area Liquid Effluent Treatment Facility
2. Commercial Operating Nuclear Power Plant
3. Fast Flux Test Facility
4. Observatory
5. Laser Interferometer Gravitational Wave Observatory (LIGO)
6. Old Hanford Townsite
7. Plutonium-Uranium Extraction (PUREX) Plant
8. B Plant
9. Prototype Surface Engineered Barrier
10. 200 Area Liquid Effluent Treatment Facility
11. Submarine Burial
12. U.S. Ecology Commercial Solid Waste Site
13. Environmental Restoration Disposal Facility (ERDF)
14. Waste Encapsulation and Storage Facility (WESF)
15. Canister Storage Facility
16. Reduction-Oxidation (REDOX) Plant
17. U Plant
18. T Plant
19. Plutonium Finishing Plant
20. Waste Receiving and Processing (WRAP) Facility
21. F Reactor
22. H Reactor
23. D and DR Reactors
24. N Reactor
25. KE and KW Reactors; Cold Vacuum Drying Facility
26. B and C Reactors

Hanford: Remaining Waste and Nuclear Materials

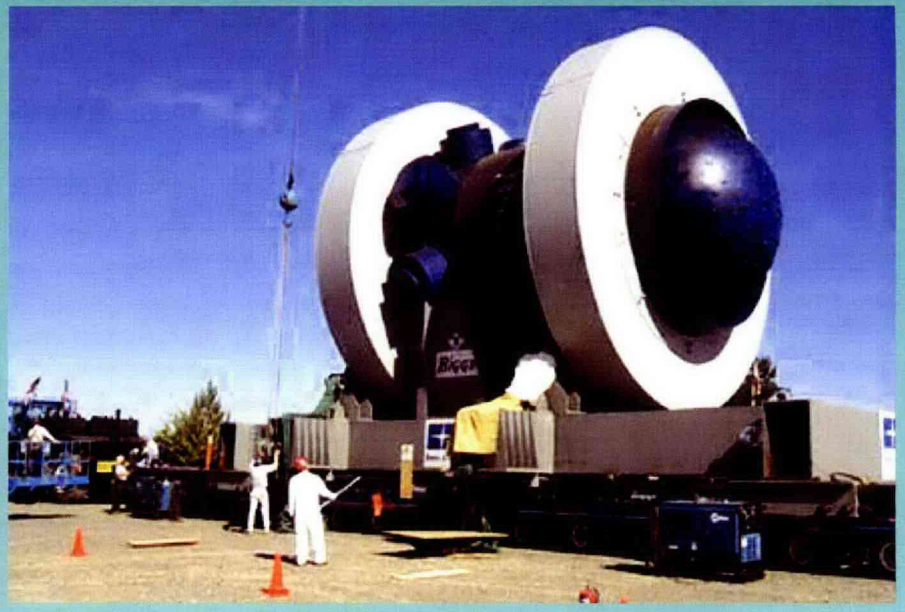
	Volume	Curies	Chemicals
 **Tank Waste**	56 million gal	190 million	240,000 tons
 **Solid Waste**	25 million ft^3	6 million	70,000 tons
 **Soil and Groundwater**	35 billion ft^3	2 million	100,000 to 300,000 tons
 **Facilities**	200 million ft^3	1 million	----
 **Nuclear Material**	25,000 ft^3	185 million	----

Hanford Compared to Nuclear Weapons Complex

- 25% of waste storage and release sites
- 40% of 1 billion curies
- 60% of high-level waste
- 80% of spent fuel
- 25% of buried solid waste
- 60% of buried TRU solid waste

Examples of other Onsite Radioactive Material

Naval Nuclear Reactor Components

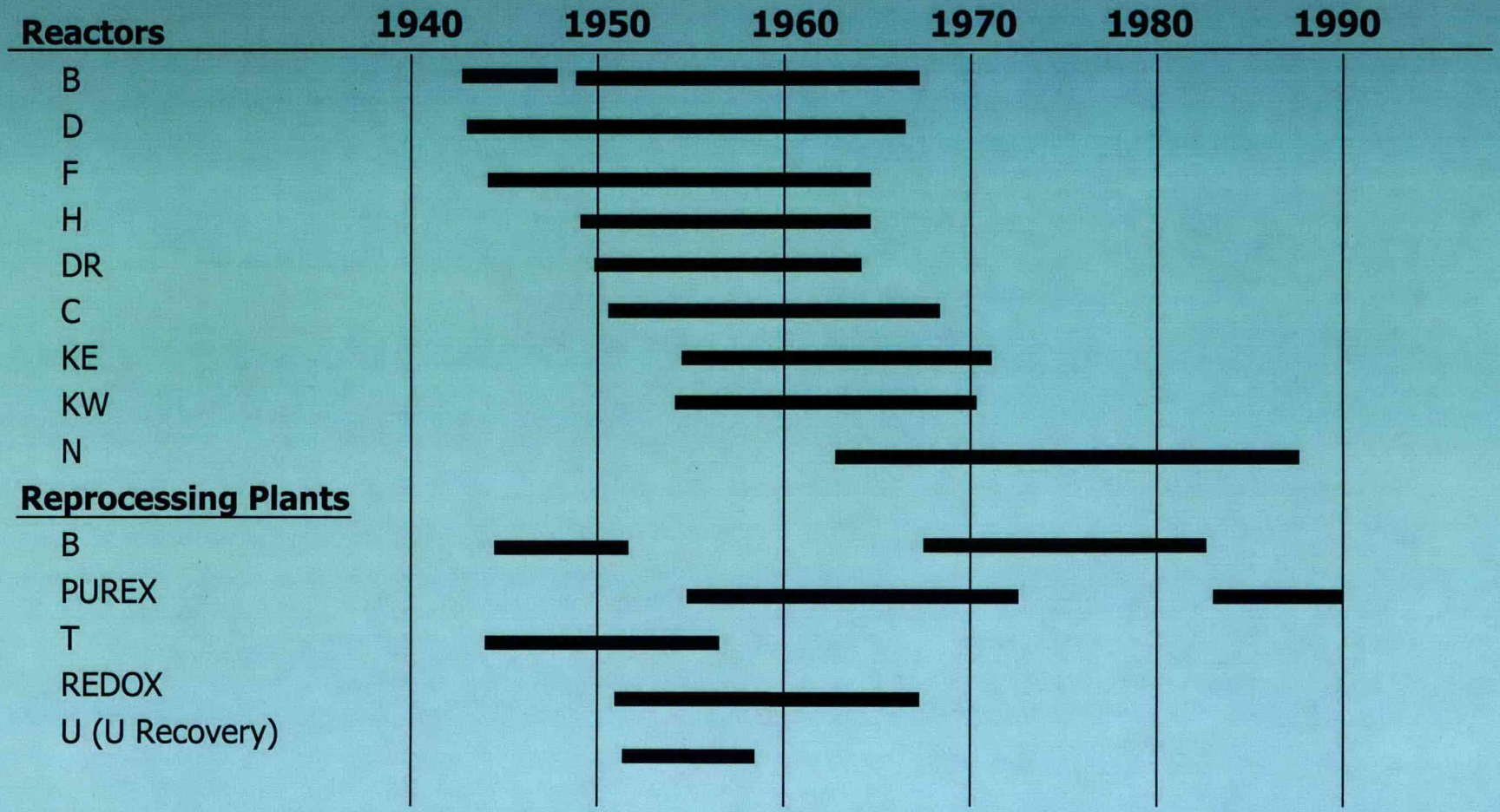


Trojan Reactor Vessel at US Ecology Site

Onsite Nuclear Material Unrelated to Hanford Plutonium Mission

	Curies	Source
	2 million	Stored Commercial Nuclear Fuel from Pennsylvania
	5 million	Stored De-Fueled Navy Nuclear Reactors
	15-20 million	Irradiated Spent Fuel in Fast Flux Test Facility
	4 million	Commercial Low-Level Waste Landfill
	13 million	"Special Waste"; ~50% glassified
Total	**39-44 million**	

Operation History for Hanford Facilities



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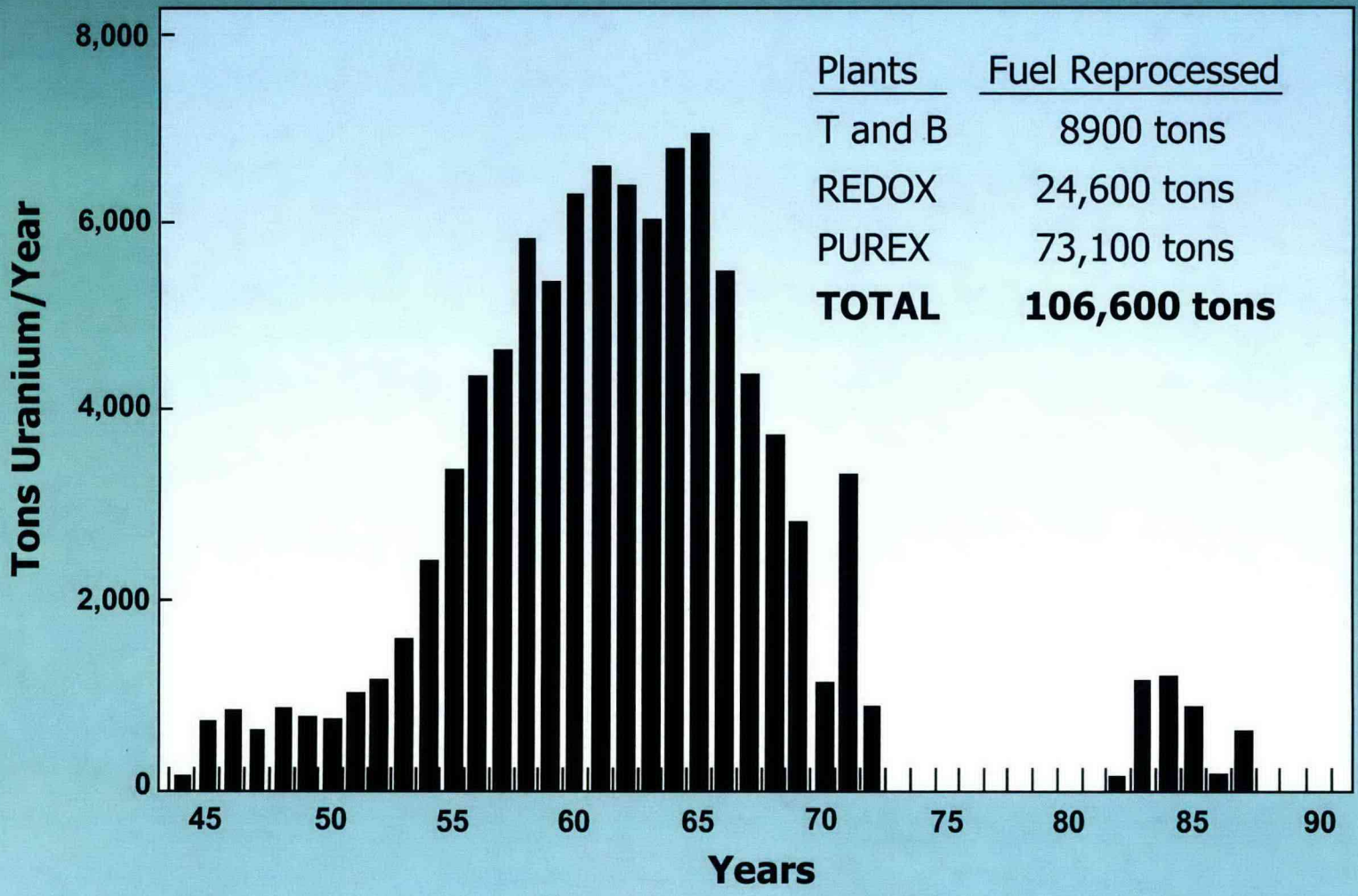
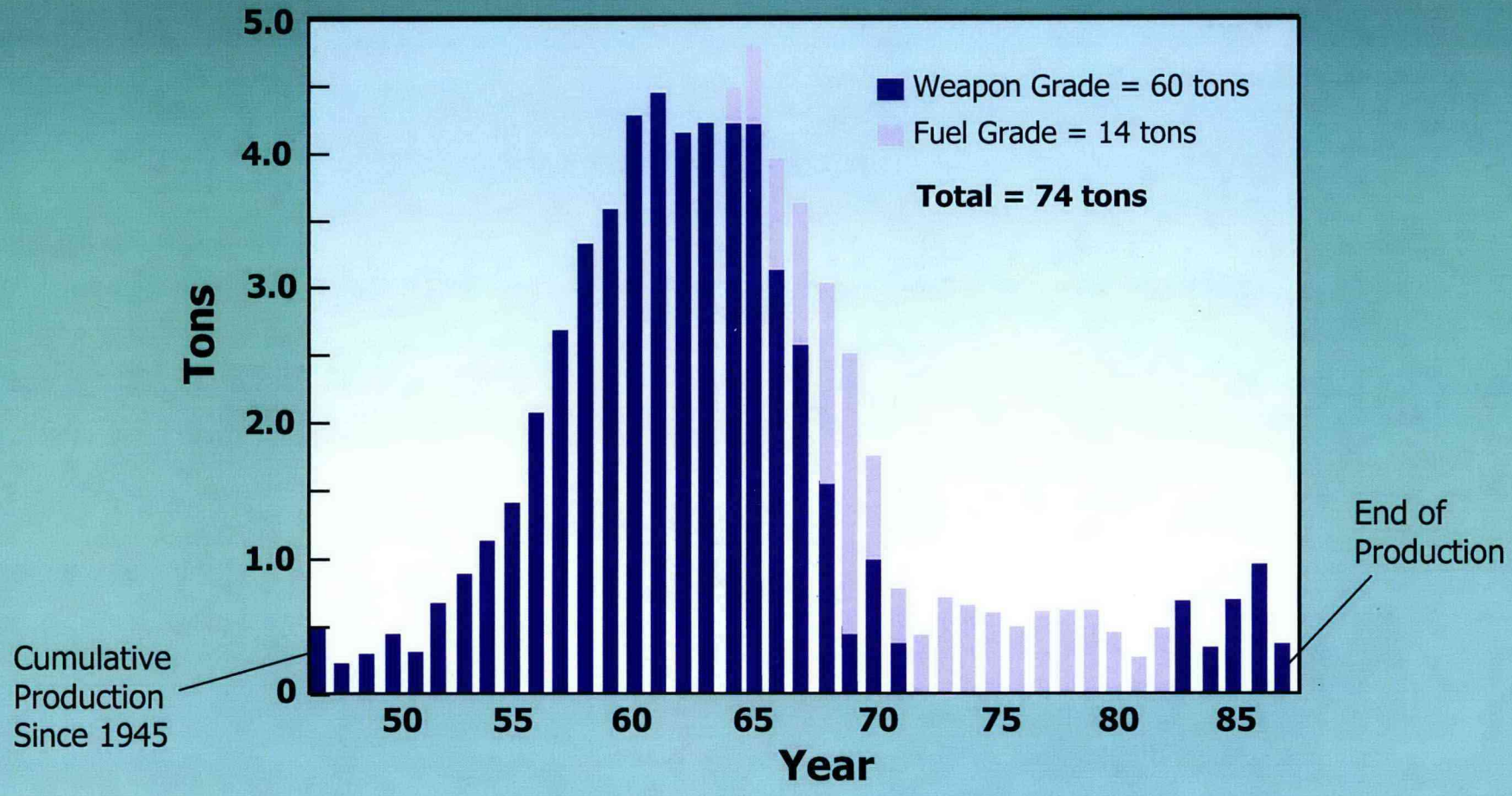
Uranium Fuel Reprocessed at Hanford

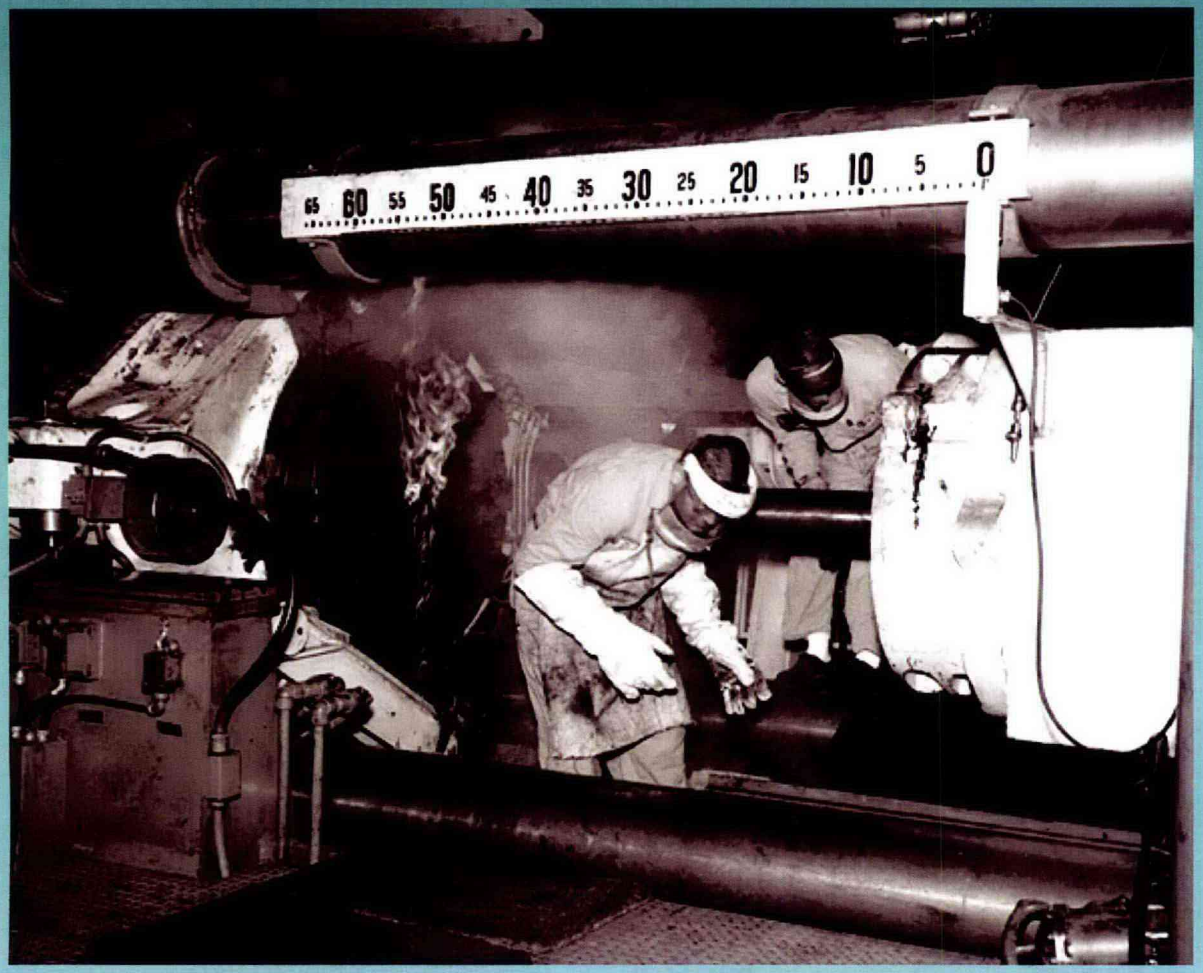


Plants	Fuel Reprocessed
T and B	8900 tons
REDOX	24,600 tons
PUREX	73,100 tons
TOTAL	**106,600 tons**

Hanford Plutonium Production



Uranium Metal Extrusion in the 300 Area

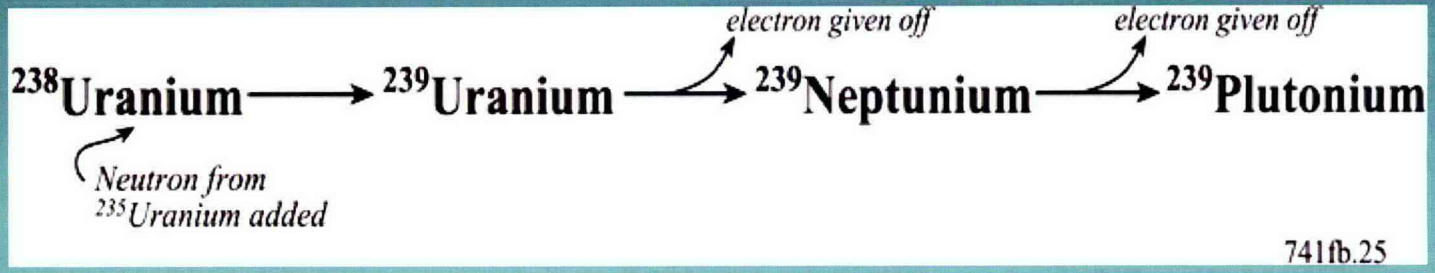


- 20 million fuel slugs
- 80% unenriched (99.7% U^{238}; 0.3% U^{235})
- 20% slightly enriched (<1.2% U^{235})
- Al or Zr clad fuel

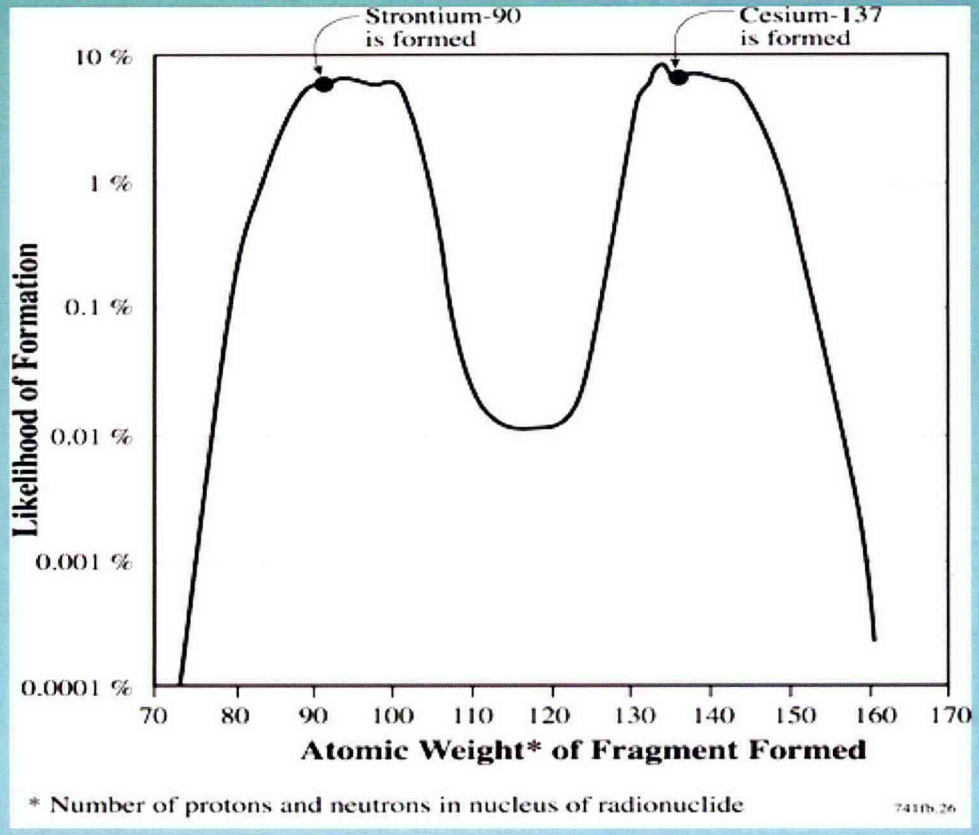
KE/KW Reactors and Support Facilities in the 100 Area

Nuclear Reactions inside a Reactor

Pu^{239} from U^{238}



Fission products from U^{235}



Average Liquid Volumes from Reprocessing Plants in the 200 Area

T and B Plants ($BiPO_4$)

- 1 to 1.5 T of spent fuel/day
- ~ 4000 gal/ton

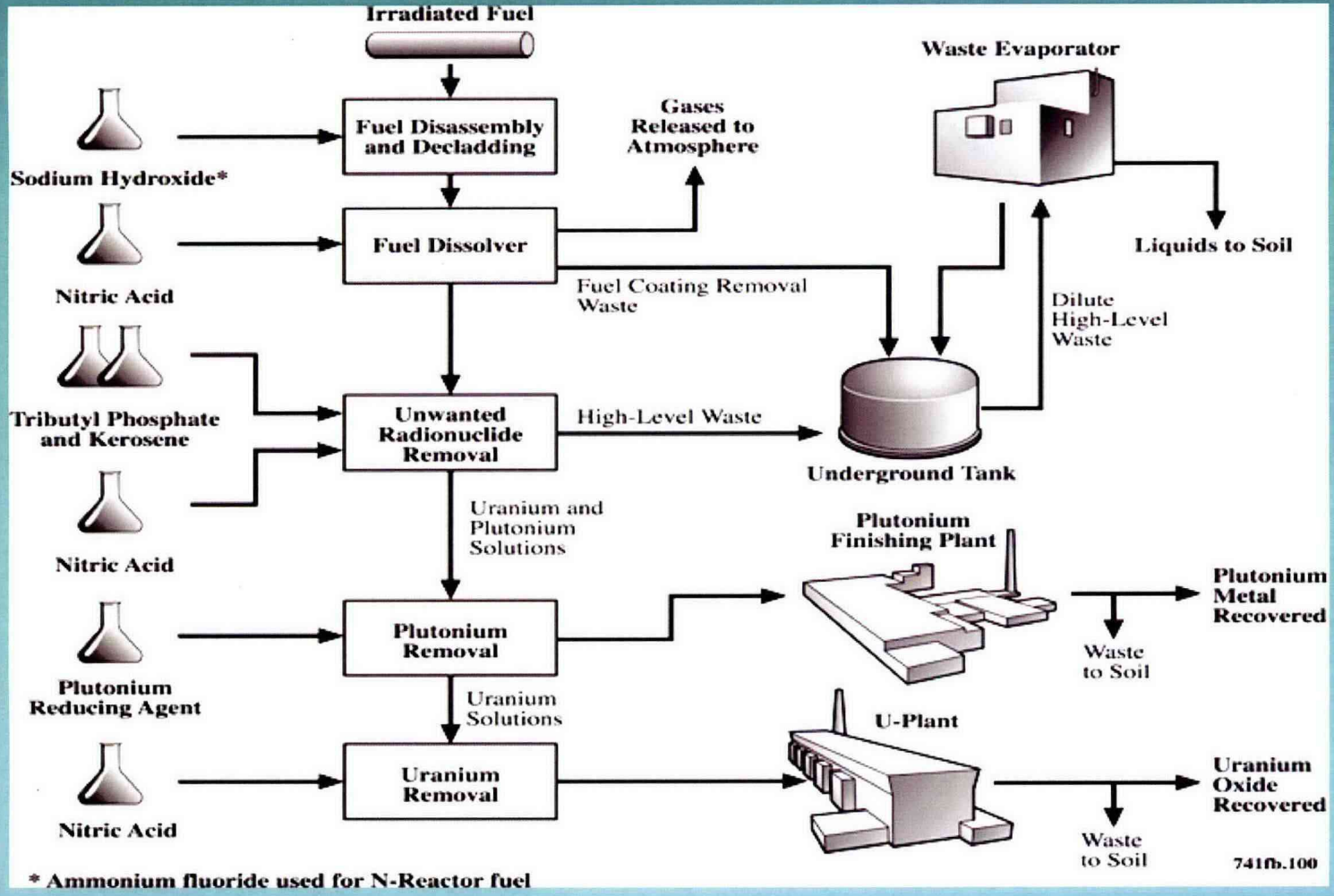
REDOX Plant (hexone)

- 3 to 12 T of spent fuel/day
- ~2000 gal/ton

PUREX Plant (TBP)

- 10 to 33 T of spent fuel/day
- ~500 gal/ton

Spent Fuel Reprocessing in PUREX



Waste Management at Hanford

Activity	Waste or Material Disposition	
Nuclear Fuel Fabrication	Highly Radioactive Waste	Tanks
Reactor Operations	Less Radioactive Liquids	Underground
Nuclear Fuel Reprocessing	Solid Waste	Buried
	Nuclear Material	Stored or shipped offsite
	Gases	Atmosphere
	Reactor Cooling Water	River

"American people were served without having to waste time explaining what was being done on their behalf."

Garry Wills, *A Necessary Evil: A History of American Distrust of Government* (1999)

Early Waste Management

- Water quality and radiation doses received downstream…were of "academic interest" compared to other "practical problems." (Kornberg 1950)
- "Working code of minimum interference" with production (Parker 1952)
- "If all this [underground] material escaped to the river we might have a poor condition, but hardly a disastrous one." Parker (1952)
- "Economic use" of entire Hanford Site (Pearce 1959)

Early Contaminant Releases

- Rainwater with radionuclide levels "up to 3 times the tolerable value." (Parker 1945)
- Thyroid tissue samples collected offsite contained iodine levels that "significantly exceeded" the chronic maximum permissible concentration for humans (Herde et al 1951)
- Some airborne particles found in Richland could give a radiation dose to the skin well above safe limits (Parker 1954)
- "Revelation of a regional iodine-131 problem would have had a tremendous public relations impact." (Stannard 1988)

Radionuclide Releases to the Atmosphere

32M curies released

- 12M curies from reactors (99% Ar^{41})
- 20M curies from reprocessing plants (90% Kr^{85})

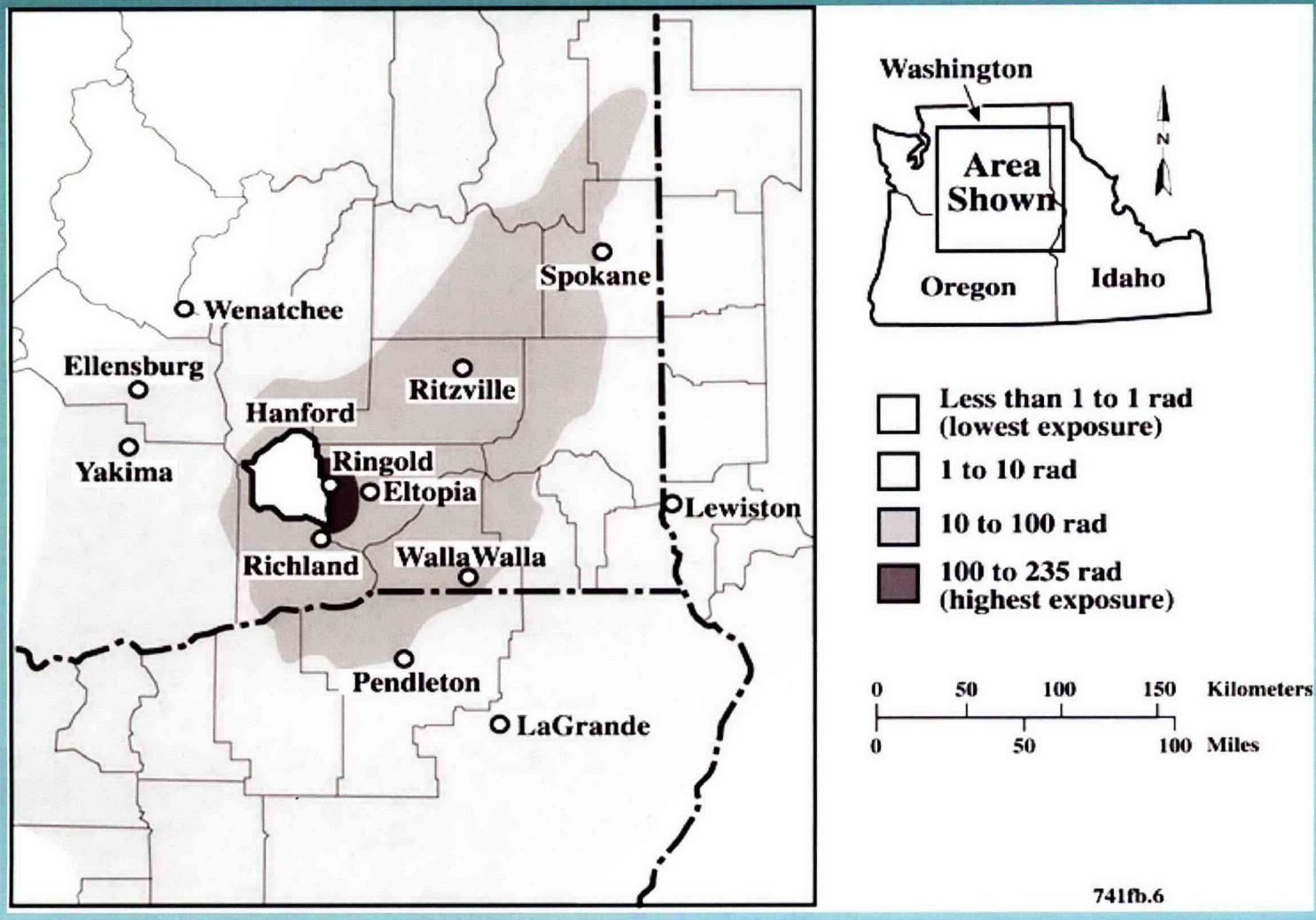
Key Radionuclides Contributing to Radiation Dose (curies)

Year	I-131	Ru-103/-106	Ce-144	Sr-90	Pu-239
1944-1949	697,000	290	1740	30	2
1950-1959	43,000	1130	630	10	<1
1960-1969	460	130	1350	25	<1
1970-1972	<1	1	50	2	<1

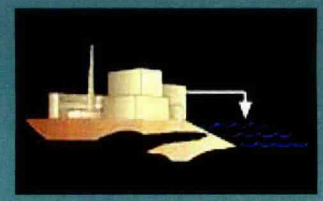
99% of dose from I-131

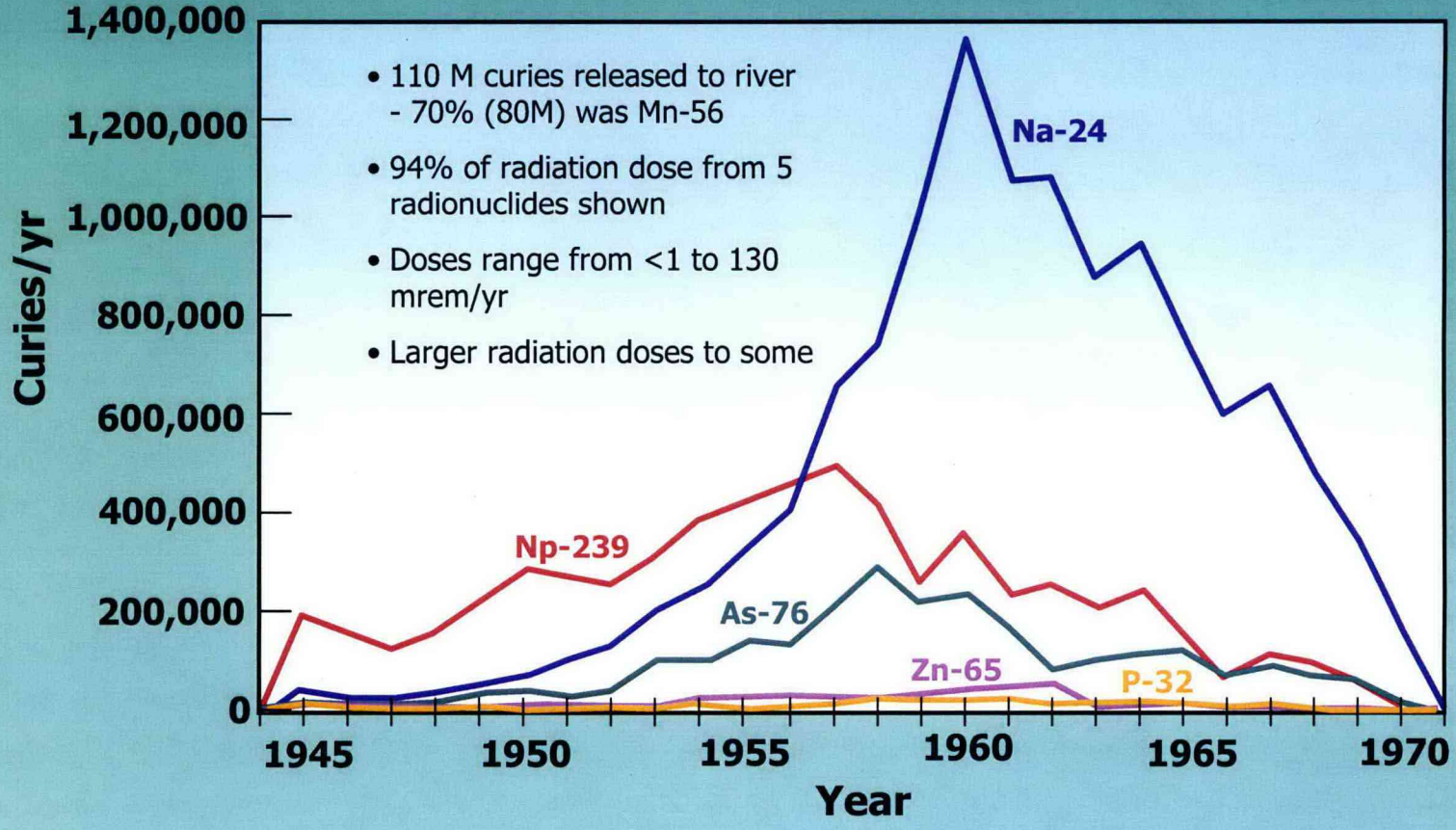
1% of dose from these radionuclides

Estimated Average Downwind Radiation Releases

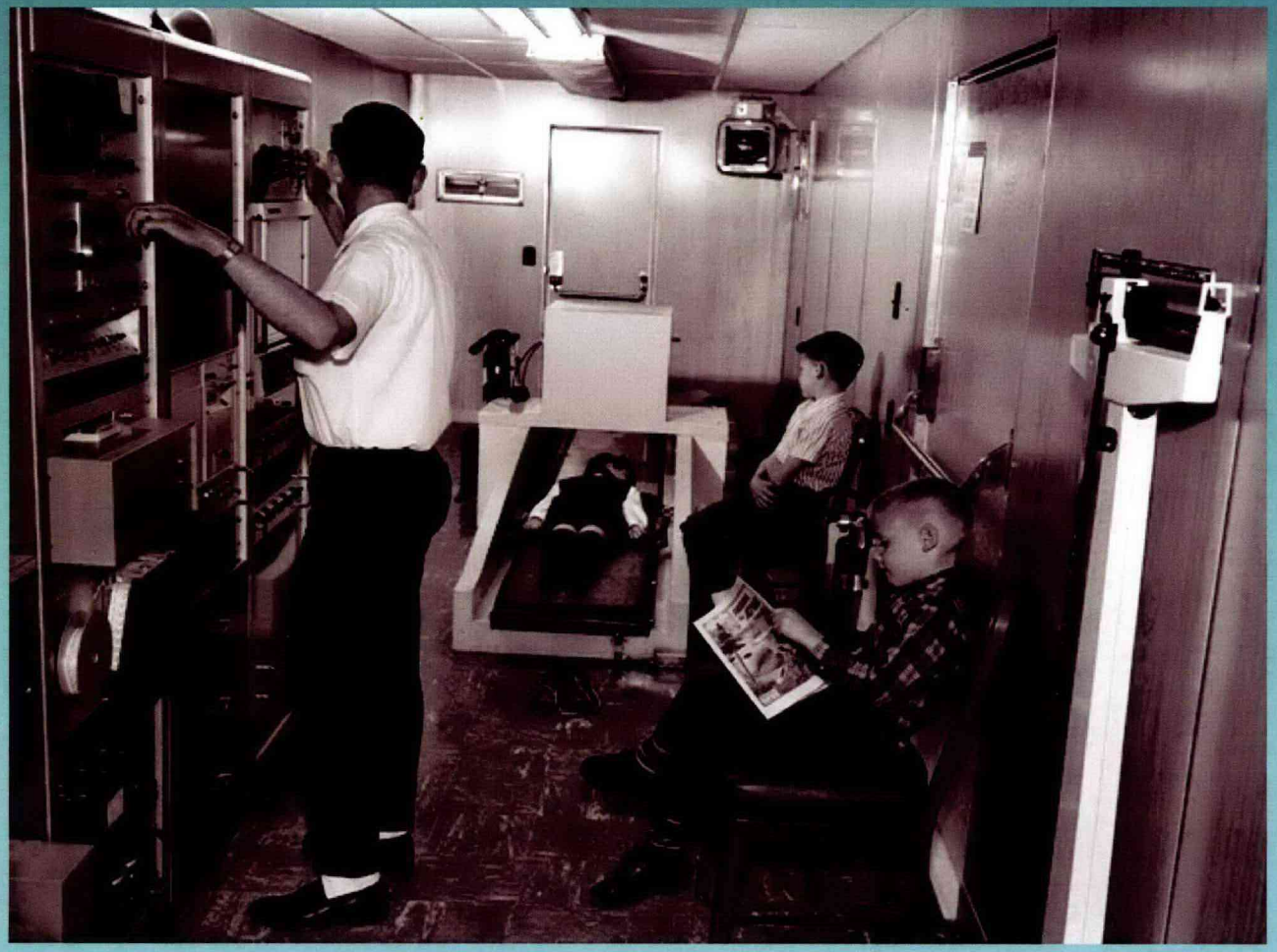


Key Radionuclides Released to Columbia River

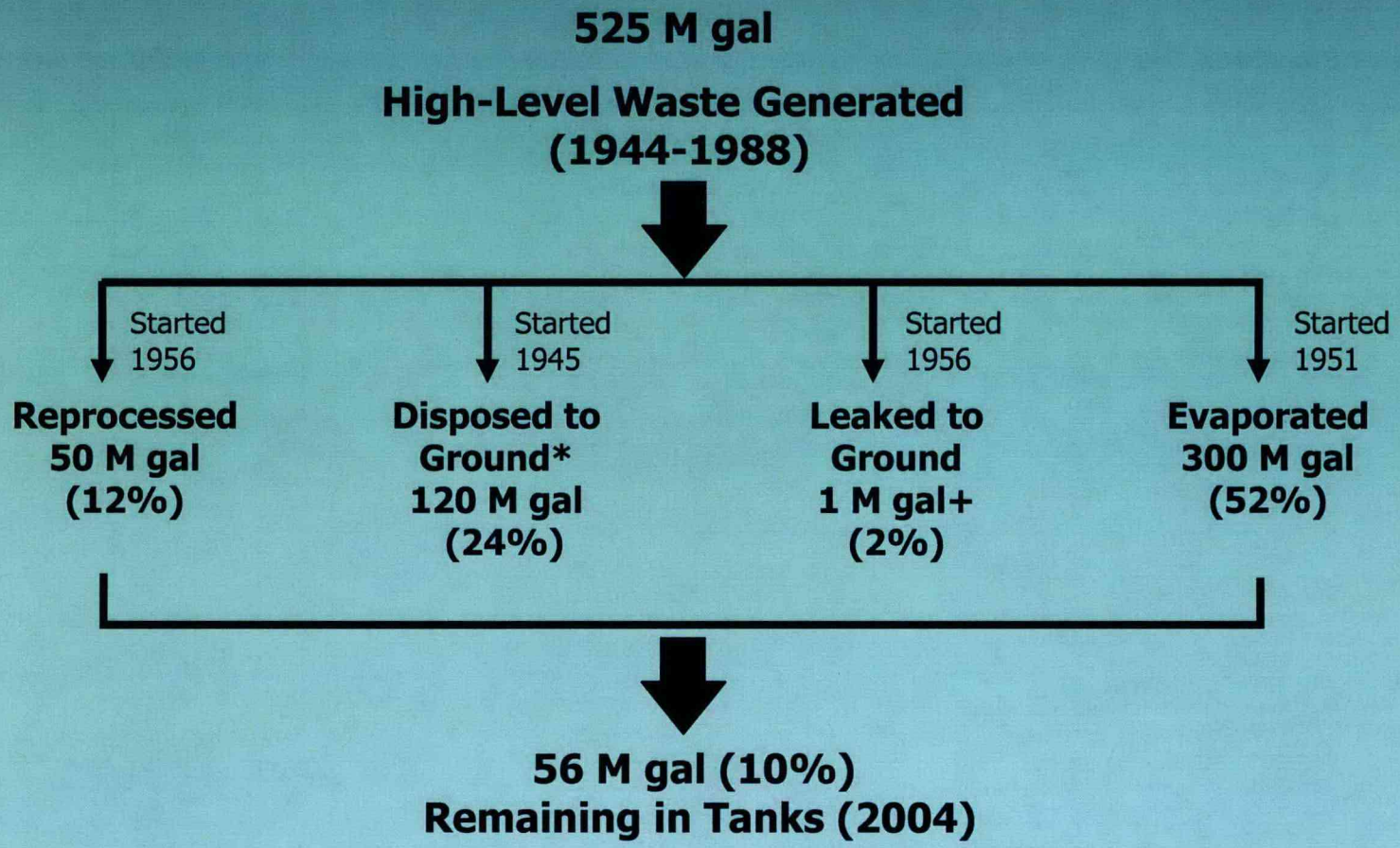




Interior of Whole-Body Radiation Counter (1965)



History of Hanford Tank Waste



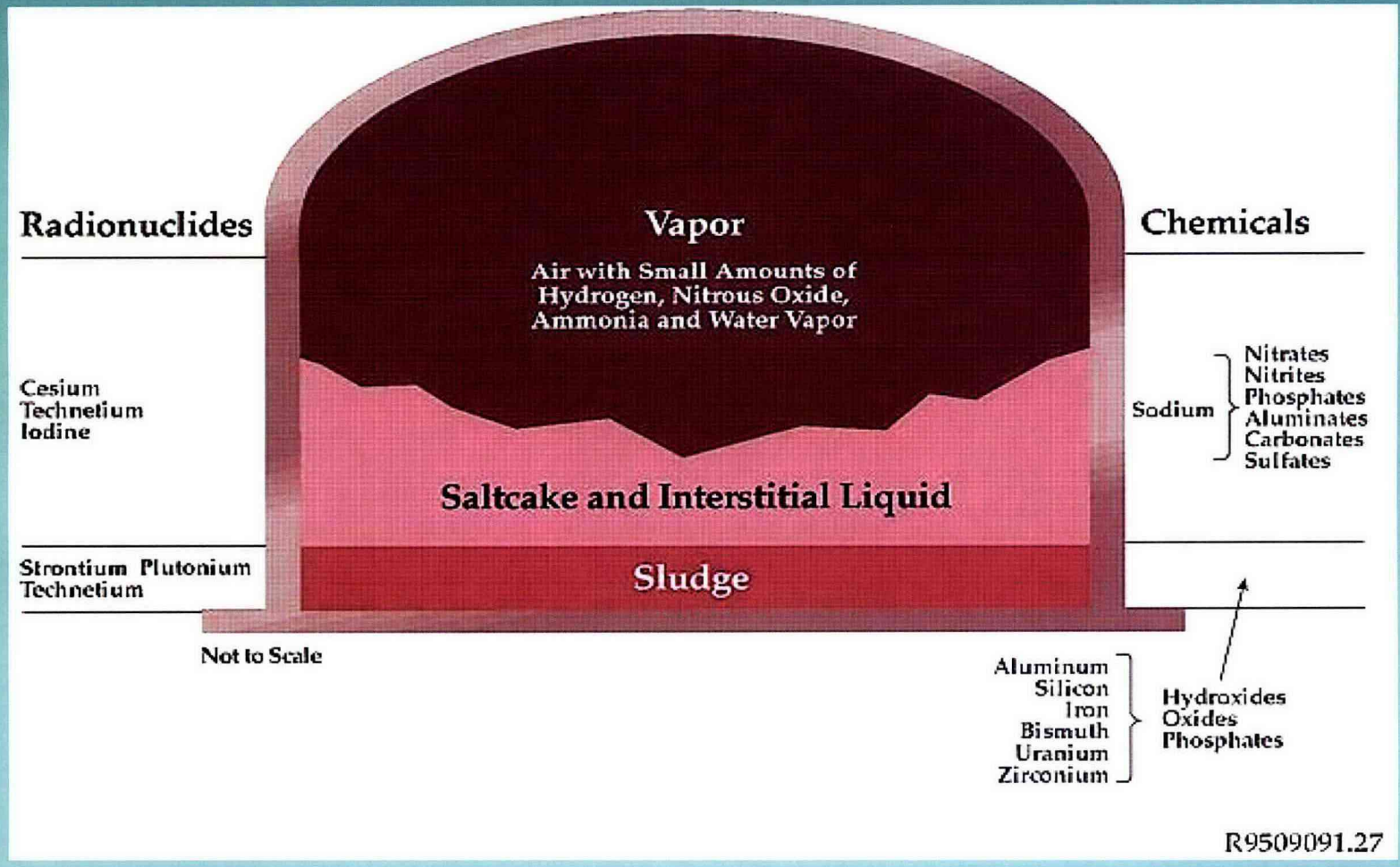
**after radionuclide scavenging or cascading*

Hanford Tanks

149 single-shell tanks
Built 1943-1964
67 leaked or suspected

28 double-shell tanks
Built 1968-1986
No leaks

Generalized Contents of Single-Shell Tanks



Unique Contents of Some Hanford Single-Shell Tanks

- 400 tons of diatomaceous earth added to 6 tanks
- 63 tons of cement added to 1 tank
- 57 plastic bottles in 2 tanks containing Pu^{239} and U
- 6 cask loads of experimental fuel and samarium "poison" ceramic balls
- 25 ft^3 of organic ion exchange resins

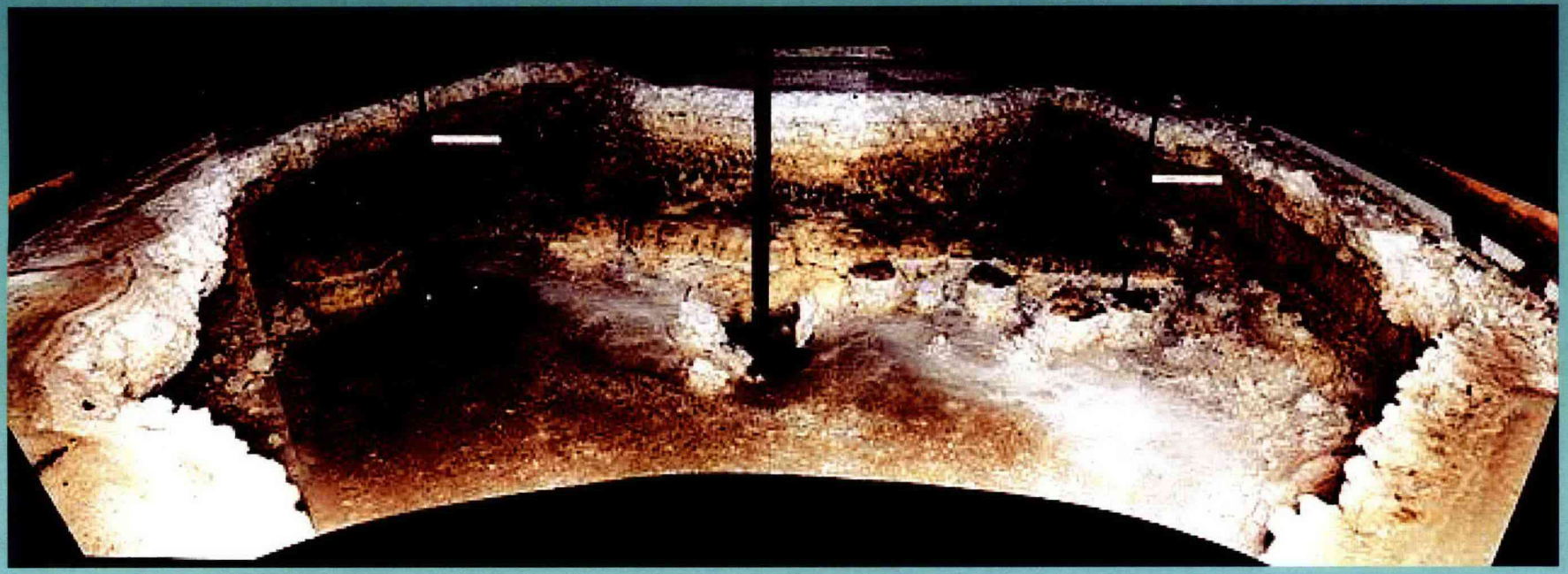
Single-Shell Tank SX-105

- 1 million gal tank
- Build 1953-1954
- No leaks

Single-Shell Tank U-104

- 530,000 gal tank
- Built 1943-1944
- Leaked 55,000 gal
- Diatomaceous earth added in 1970s

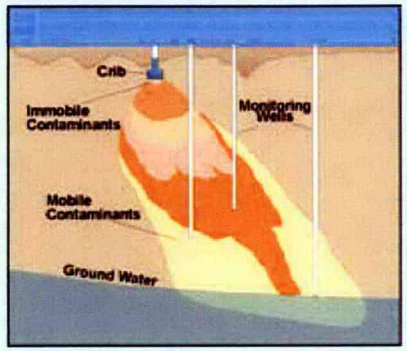
Single-Shell Tank B-105



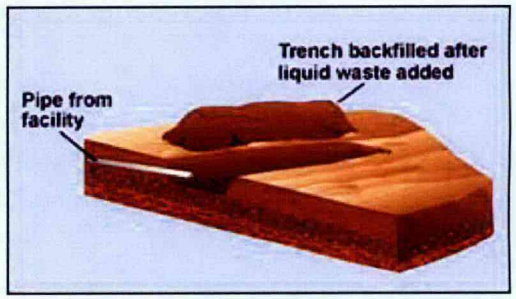
- 530,000 gal tank
- 75 ft diameter
- Saltcake layers show past waste levels
- 8000 gal assumed leaked

Methods of Liquid Releases to the Ground

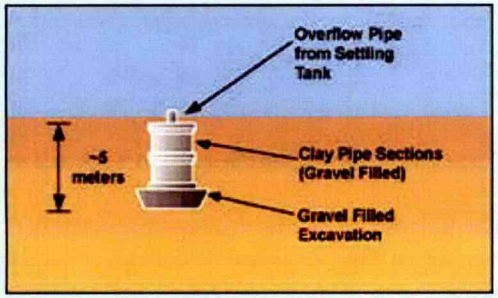
Cribs
1944-1990s



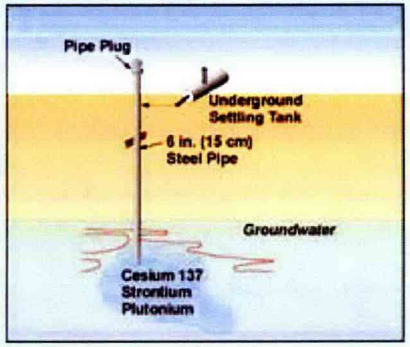
Specific Retention Trenches
1944-1973



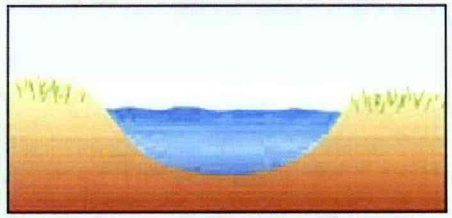
French Drains
1944-1980s



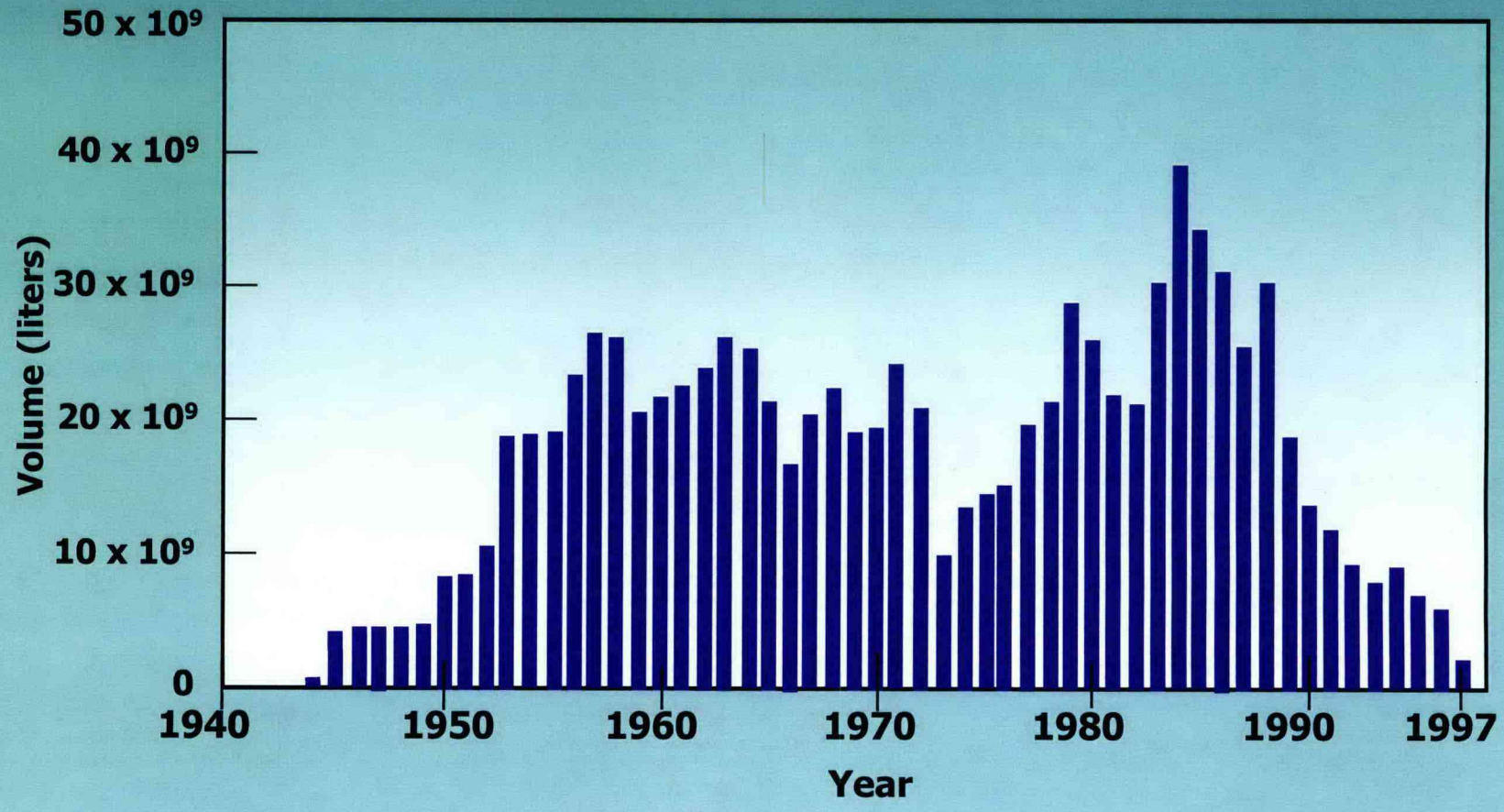
Reverse Wells
1945 - 1955
(one to 1980)



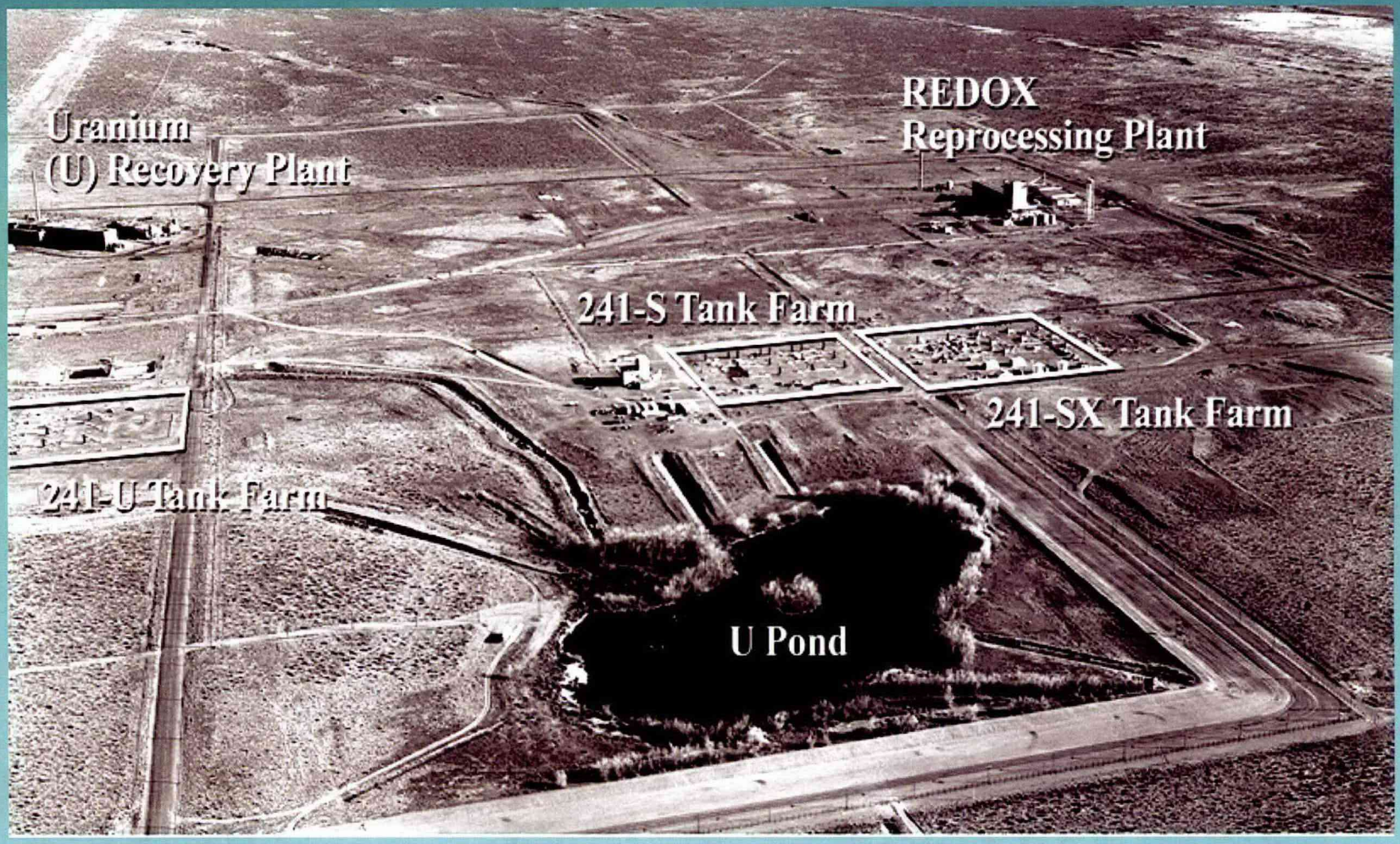
Ponds
1944-1990s



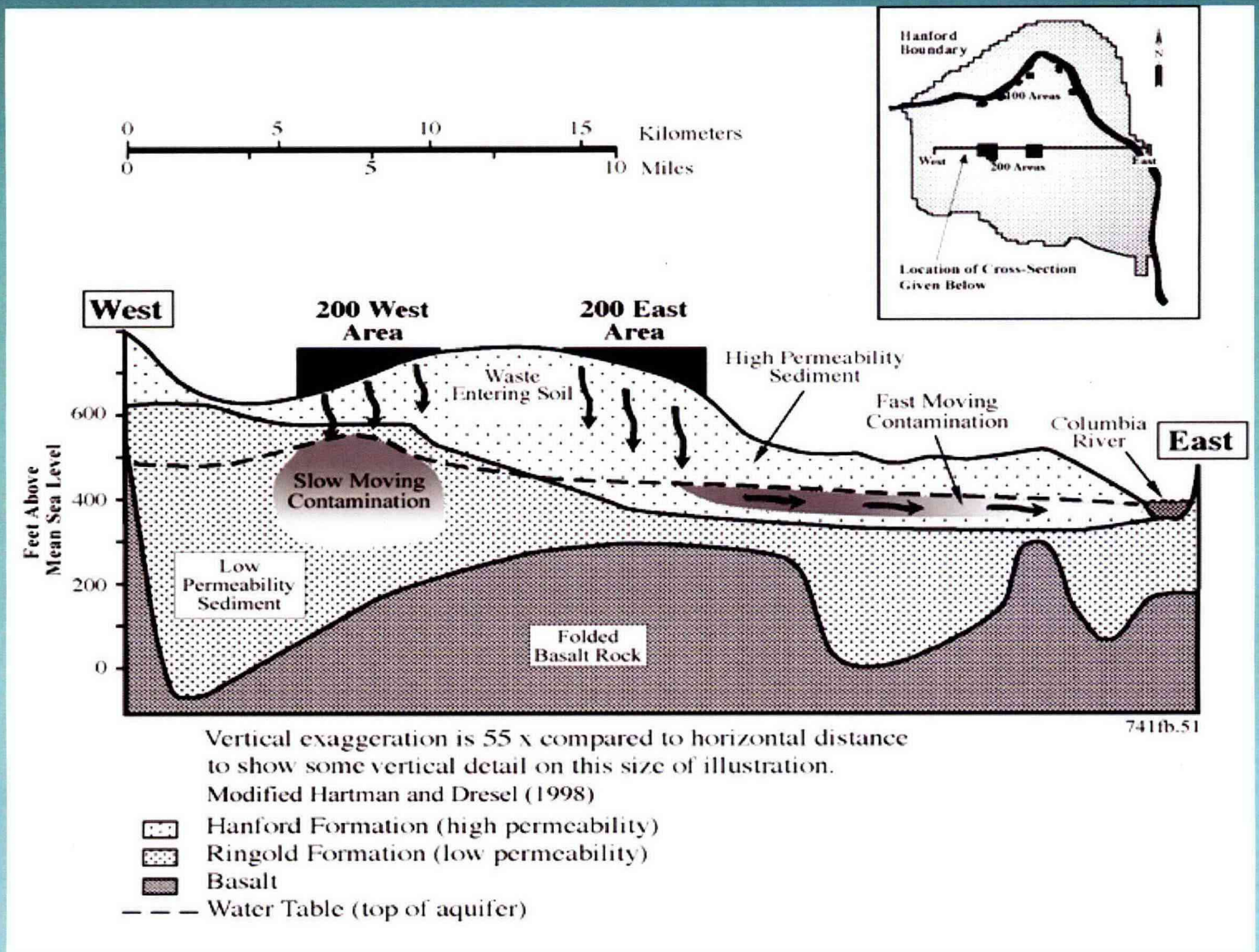
Liquids Discharged to Ground (450 billion gal)



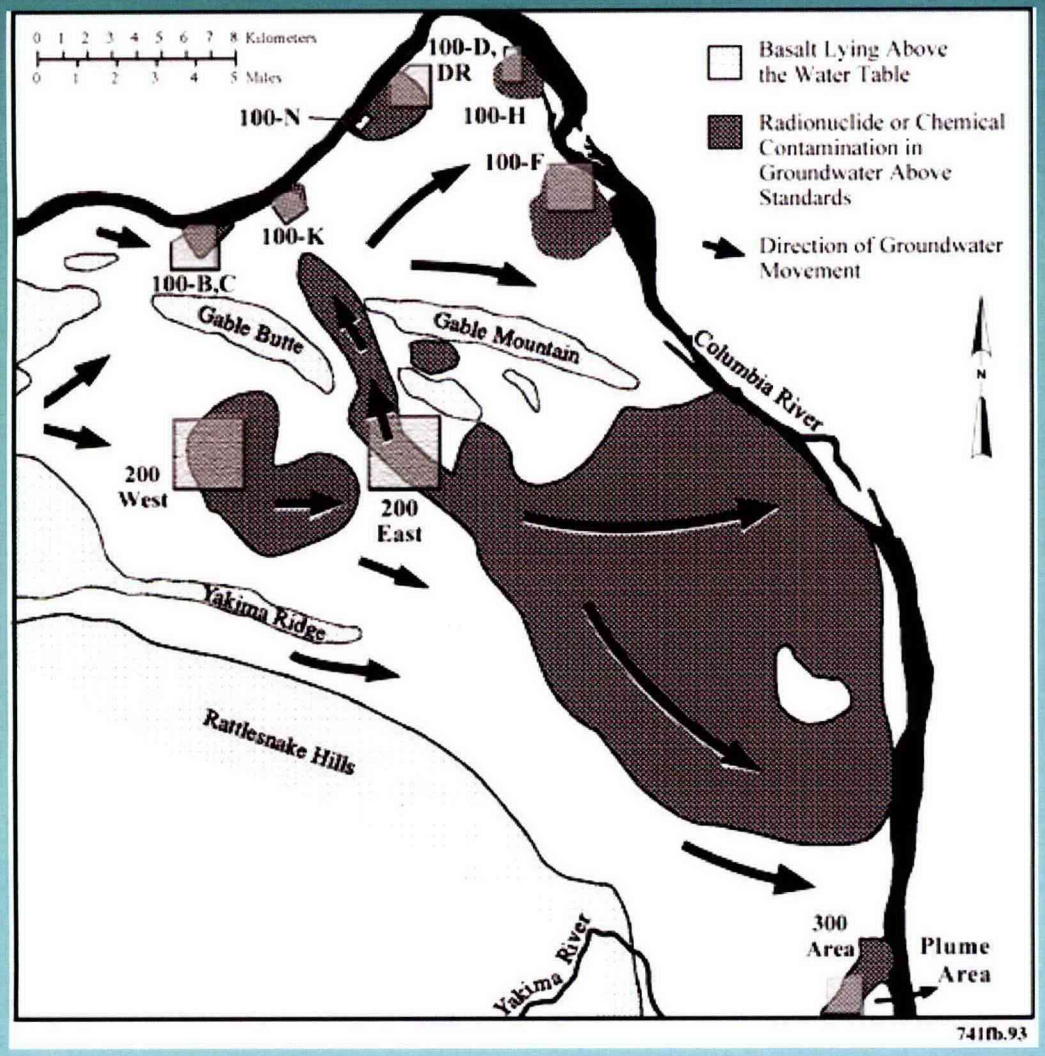
U-Pond and Adjoining Areas (1962)



Generalized Geologic Cross-Section

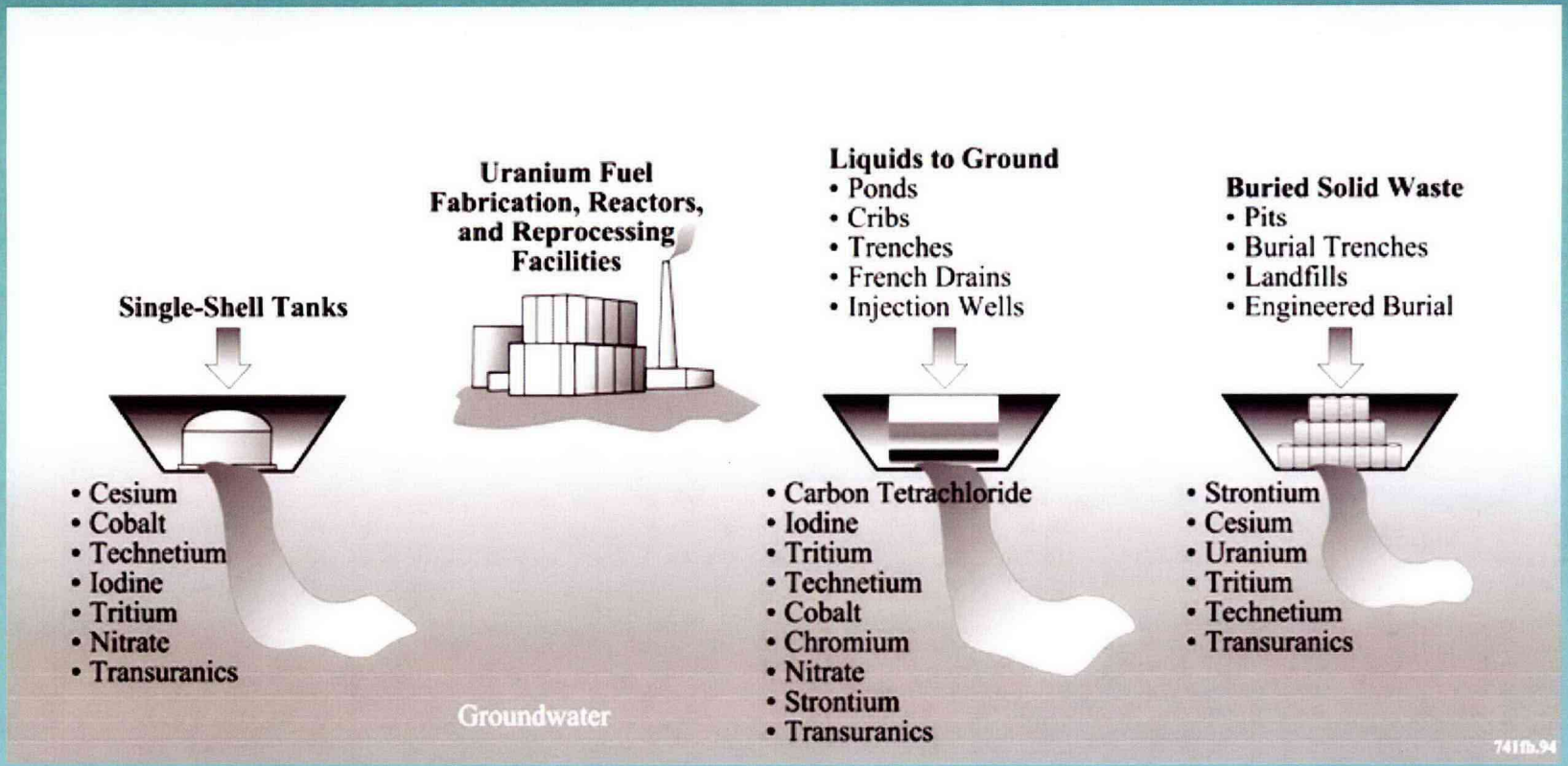


Groundwater Flow Patterns and Plumes



- 80-100 mi^2 above drinking water standards
- 1.8 M curies (40% from tank leaks)
- 100K to 300K tons of chemicals
- Plumes H^3, NO_3, I^{129}, Cr^6, CCl_4, others

Examples of Contaminants in Hanford Soil and Groundwater



Buried and Stored Solid Waste

Early Years

Later Years

- 25M ft^3 of low-level and transuranic waste (60% buried pre-1970)
- 10% transuranic contaminated
- 75 solid waste burial grounds (8 active)
- 6 million curies; 70,000 tons of chemicals
- 800 pounds of Pu
- 650 tons of U

Nuclear Materials Onsite

- 2300 tons of spent fuel (55 M curies)
- 90% dried, packaged, and stored

- Cs and Sr capsules (130 M curies)

Changing Face of Onsite Waste and Nuclear Materials

Time	Yesterday	Today	300 Years	1000+ Years
Total Radioactivity	1 Billion Curies	400 Million Curies	1 Million Curies[1]	400,000 Curies
Dominant Radionuclides	Cesium Strontium Short-Lived Radionuclides[2]	Cesium Strontium	Cesium Strontium Long-Lived Radionuclides[3]	Long-Lived Radionuclides[3]
Chemicals and Metals	400,000 to 600,000 Tons			

[1] Assumes 99.9% is cesium-137 and strontium-90.
[2] Examples include isotopes of argon, krypton, manganese, sodium, and neptunium.
[3] Examples include isotopes of plutonium, americium, technetium, and iodine.

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What is Cleanup?

- No single answer
- Negotiated end-state (exit-point?)
- Adaptive process--learn as go
- Bottom line: health and environmental protection
- Science (knowledge) and technology (capability): partners in decisions/actions used to explain and enable
- Society: directs what's done based upon desirability

TPA-Sponsored End States Workshop #1
June 23 and 24

Purpose: **Launch the End States public dialogue and portray the desired end states for the 100 Area of the Hanford Site**

Venue and timeline:

Consolidated Information Center (CIC)
2770 University Drive
Richland, Washington
2nd Floor conference room and breakout room
June 23: 8 a.m. – 4:30 pm
June 24: 9 a.m. – 12:00 pm

Agenda:

June 23

8-9 a.m. **TPA Leads:**
Orientation: Welcome; Brief Overview: Introduction to Hanford and overview of Hanford Contaminants (Roy Gephardt)

9 a.m. **TPA Leads:**
Welcome, Opening Comments, Participant Introductions

Overview of the End States Development Process (15 mins)
- Process overview:
- Tri-Parties' goals for this process
- Final outcomes

DOE Office of Legacy Management (15 mins) – Dave Geiser
- Overview of their role, how land will be transferred, land management options, institutional controls, etc.

Brief portrayal of site-wide current configuration of contaminants; Overview of 100 Area and features (15 mins) - Dennis Faulk
[Including geographic areas along the river not specifically covered in this workshop (not contaminated)]

9:45–10 a.m. **Break**

10 a.m. **Set-up group discussions at three "stations":**
- Reactors
- 100 Area Land Use Activities
- River pipelines, Groundwater and Riparian Zone

Groups circulate among stations for briefing, Q&A, respond to pre-determined questions
Groups develop responses to questions, statements or portrayals of desired end states, consensus, disagreements, etc.

10:15 a.m.	**1st Break out – one group at each station**
11:45 a.m.	Lunch
12:45 p.m.	**2nd Break out- rotate groups to stations**
2 p.m.	Break
2:15 pm	**3rd Break out - rotate groups to stations**
4:00 p.m.	**Close-out the day** - Brief summary from note-taker at each station
4:30 p.m.	**End of Day One**

June 24:

8 a.m.	**Overview of the day**
	Discussions with HQ representatives
9 a.m.	**Agencies: "What we've heard" from Day 1**
9:30 a.m.	**Attendee feedback and discussion on "What we've heard"**
10:15 a.m.	**Break**
10:45 a.m.	**Additional discussions** (as necessary – seeking convergence among groups; additional clarity or detail on key questions)
11:30 a.m.	**Path Forward** - Next workshop(s) dates, topics, invitations, recommendations - Recommendation re: go or no-go public meetings - Potential development of draft HAB advice from discussions - Notes from this workshop to be reviewed at next workshop
12:00 noon	**Wrap-up**

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100 Area land use activities

- Question for discussion:
  - A final regulatory decision must be made for the 100 Area cleanup. Given the National Monument designation and the Department of Energy Record of Decision on land use, what post-cleanup activities do you see for the 100 Areas?

Graphics (to be provided by John Crigler)

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Hanford Site End State Vision

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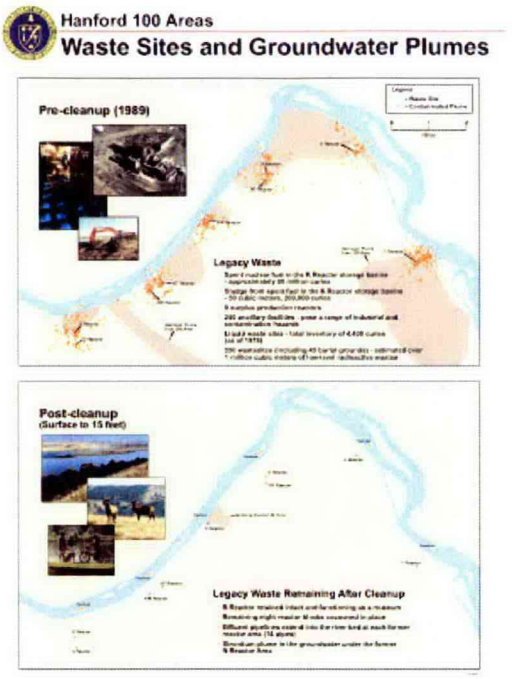
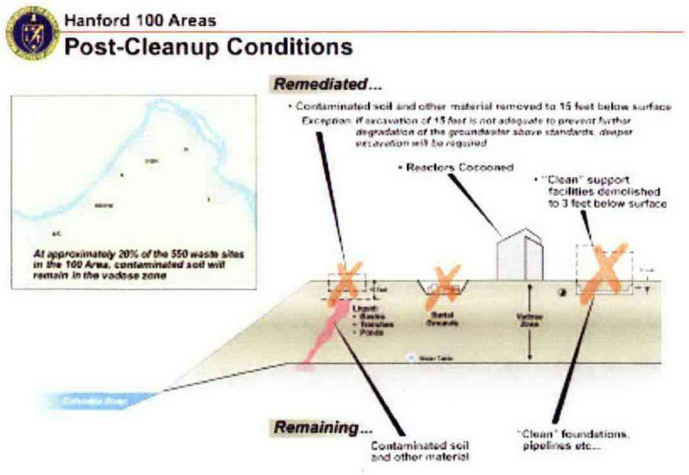
100 Area land use activities

- Hanford 100 Areas - Waste Sites and Groundwater Plumes



- Hanford 100 Areas - Post-Cleanup Conditions



- Hanford Site - Post-Cleanup Vision

For questions or comments, please send a message to RBES@rl.gov
URL: http://www.hanford.gov/docs/rbes/6-23_Breakout_100_Graphics.cfm
Last Updated: 07/19/2010 08:04:05

100 Area End State Workshop, June 23 – 24, 2004
100 Area Breakout
Question: What post-cleanup activities do you see for the 100 Area?

The following is the overall summary developed by the entire group

Post-Cleanup Near-Term Activities

•For the next 50 years, or as long as a Federal entity is controlling the lands, activities will be consistent with the National Monument designation and conservation/preservation land uses, as detailed in the following two slides.
•Preservation of last native shrub-steppe habitat in Columbia Basin
•Continued general public access to river
•Wildlife refuge
•Recreational and tourism uses
  -Boating (motorized and non-motorized)
  -Fishing
  -Camping
  -Hunting
  -Swimming
  -Hiking
  -Photography
•Tribal uses (fishing, hunting, gathering, sweathouse)
•Protection of cultural and historical resources
•Hanford Reach boat tours
•B-Reactor Museum with bus tours during daylight hours
•Park area between Vernita Bridge and B-Reactor
•Resident ranger and family

Post-Cleanup Long-Term Activities

•The further out in time, the broader the range of possible activities/exposures envisioned.
•Many seen to be possible/reasonable, such as:
  -Preservation of shrub steppe habitat
  -Continuation of all identified near-term activities
  -Individual residences
  -Possible resurrection of old Hanford town site
  -Hotel with swimming pool near National Monument
  -Commercial activities (e.g., restaurant, souvenir shop)
  -Agricultural uses (e.g., fruit orchards, tree farms for wood pulp)
  -Industrial activities (e.g., gravel mining, manufacturing)
  -Reinstated railroad access to 100 Areas
  -Wildfire protection and law enforcement personnel housing in 100 Areas
  -Oil and gas leasing
•No activities were particularly endorsed. Breadth of ideas should be considered for risk and exposure analyses.

100 Area End State Workshop, June 23 – 24, 2004
100 Area Breakout
Question: What post-cleanup activities do you see for the 100 Area?

Raw notes from 100 Area activities discussion:

Group 1 – Facilitator - Doug Huston

- More stringent cleanup to pre-Hanford conditions desired by Nez Perce Tribe
- Tribal fishing, settling, utilization of all Site resources (including groundwater)
- Tribes hope institutional controls are not required.
- B-Reactor Museum available to the public. Could fold into Hanford Reach National Monument. Bus/car parking and boat dock. Day use only via bus tours. No overnight use. Curator needed during day only. Perhaps custodian service in the evening. Keep open for the long term. Interpretive Center? Gift shop? Boat tours as part of Hanford Reach tours.
- Resident ranger (and family) to manage the Monument
- Railroad access and tours to Monument and B-Reactor Museum
- Wildfire protection and law enforcement will be needed. Will require housing in 100 Area in long term.
- Continued general access to the river with campsites for canoes and kayaks, water skiing, primitive facilities.
- Vendors doing Hanford Reach boat tours could have one campground site available for their use.
- Walking trail along Hanford Reach area with picnic facilities and drinking water?
- Risk assessment must target children (e.g., swimming).
- More than day use to wander around the area.
- USFWS Alternatives C and D are popular with people who want outdoor recreational uses such as hiking and hunting.
- Conservation and preservation
- Some public participants at the recent USFWS workshops want only non-motorized boats in the Reach.
- National Wildlife Refuge to protect large and small creatures.
- Unrestricted use means deep cleaning and waiting for groundwater access.
- Long-term vision– likely that 100 Area would be developed for housing. Can that be prevented? Can the Reach be protected as an undeveloped natural resource? Must fight the trend to develop the land along the river.
- Nez Perce, Yakamas, and Umatillas could manage the land areas not in the National Monument.
- Industrial access to areas not on the river for mining (e.g., gravel).
- How will 200-Area activities and groundwater plumes impact the 100 Area?
- Need a balance between preservation and other various end uses.
- Maintain public protection forever.

- USFWS cannot acquire contaminated land (or land with contaminated groundwater).

Group 2 – Facilitator - Susan Leckband

- Conservation/preservation
- Houses or hotels near Monument Land
- Institutional controls will fail in 100 years
- Overnight camping, boating, hiking
- Fishing and hunting
- Traditional Tribal uses
- Commercial amenities (e.g., restaurant)
- Tours of Monument
- Keep land open, but with USFWS restrictions to protect the public.
- Consider that the risk assessment must protect people who don't follow the rules.
- Hotel with swimming pool may require excavation below 15 feet.
- Will have to fight encroaching development.
- Will B-Reactor Museum have a lawn? Groundwater use for watering?
- Wildlife protection on the Monument
- Interpretive Center on the Monument
- Are hotels, concessions, etc. compatible with the wildlife protection mandate of the USFWS? Possibly, but difficult to manage.
- Farming (e.g., orchards) on land north of Gable Mountain and south of the river in the long term (100-300 years from now). Is potential radioactivity a big issue? Could bad publicity regarding radioactivity devastate Washington agriculture?
- Public access, recreation, tourism, fishing, hunting, hiking
- Motorized recreational vehicles should not be allowed in the area, but kids may break the rules, and they must be protected.
- Consider a wildfire scenario.
- Tribal scenario must include water use for sweathouse.
- Locations of cultural resources must be protected.
- Is there a land release strategy? Which areas are to be released first? All at once?
- Water rights for agriculture could be a problem. If people aren't allowed to use the river, wells could be drilled regardless of groundwater restrictions.
- Oil and gas leasing

Group 3 – Facilitator - Gariann Gelston

- Preserve B-Reactor as a museum.
- Is there a traffic management plan for the museum? Bus tours only?
- No plan to limit vehicle traffic to Reach Monument land.
- Area from Vernita Bridge to B-Reactor should be a park.

- Restore/preserve last native shrub-steppe habitat in Columbia Basin and provide facilities for the public to view the area.
- Rural residential land use? Not in the near term (due to need for irrigation water), but maybe in the long term.
- Is the 15-foot soil cleanup depth adequate to protect human health? Yes. Could the contamination move upward into the clean soil? No.
- Could there be a town along the river (e.g., the old Hanford town site) in 50 years? Depends on status of groundwater plumes.
- Institutional controls are needed for:
    - No digging below 15 feet
    - No drilling below 15 feet
    - No groundwater use
    - Long-term monitoring of existing groundwater wells
    - Reach Monument is forever.
- Septic disposal for bathrooms at the Monument.
- Minimize construction of new roads.
- Destroy some existing roads?
- No motorized vehicles on the river
- Climbing, hiking, photography
- Facilities for the disabled
- Preserve historical sites at the old Hanford town site
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100 Area End State Workshop, June 23 – 24, 2004
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Reactors

- Question for discussion:
  - Should the reactor blocks be moved to the Central Plateau? If so, now or at the end of an interim storage period?

For questions or comments, please send a message to RBES@rl.gov
URL: http://www.hanford.gov/docs/rbes/6-23_Breakout_reactor.cfm
Last Updated: 07/19/2010 13:42:10

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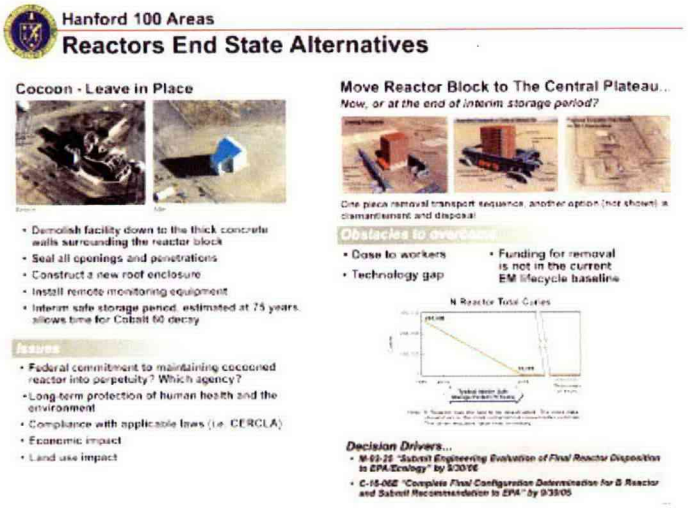
Reactors

- Hanford 100 Areas - Reactors End State Alternatives



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BOBBY v3.1 APPROVED

100 Area End State Workshop, June 23 – 24, 2004
100 Area Reactors Breakout
Question: Should the reactor blocks be moved to the Central Plateau? If so, should they be moved now or at the end of an interim storage period?

The following is the overall summary developed by the entire group

All Cores Except B Reactor

- Interim Safe Storage (ISS) in place for up to 75 years (EIS ROD)
  - Allow cobalt-60 to decay – lower worker dose

- Safe Storage Attributes
  - 75 year life (based on roof; concrete shield robust)
  - Evaluate airplane impact
  - Inspect cocoon/core periodically (5 year Review)
  - Not source of contamination outside cocoon

- All believe final remedy required – split on decision to move
  - May prove safe to leave, but other factors may drive move
  - If left, may provide "reminder" of Hanford Site

- Native American participants comfortable with leaving for a while, but strongly want ultimate move

- Allow time before final disposition decision. But, most preferably before DOE closes Site (e.g., 2035 allows significant cobalt-60 decay)

- Don't presume final disposition or technology – make and execute decision in future
  - Make future removal possible – funding concern– trust fund may be OK
  - Can't decide now where will be moved – 200 Area possible
  - Consider also:
    - Aesthetics
    - Consolidation for ICs
    - Interference with/by anticipated 100 Area Uses

- Look for new technologies that become available
  - Can't predict now what might be available
  - Evaluate in periodic (e.g., 5 year) reviews

- One-piece move should be avoided if possible
  - Road building/removal for transporter will impact environment
  - C-14 release potential may complicate

B Reactor

- Has Important Historical Value
  - Very strong support for museum option
  - Must be in safe configuration
    - Safe as is for 10 years operation and maintenance (O&M); roof replacement then
    - Will need restrictions for anticipated 100 Area land uses
  - Consider separation from core
    - Relocate important features to highway

- Important factors in timing for museum/preservation determination
  - Identifying funding
    - 2005 TPA milestone may drive decision before funding identified – milestone extension OK if in safe configuration
  - Development of Monument plans
  - Consider with ISS path for other Reactors
    - Evaluate O&M and ISS for B Reactor for 75 years

100 Area End State Workshop, June 23 – 24, 2004
100 Area Reactors Breakout
Question: Should the reactor blocks be moved to the Central Plateau? If so, should they be moved now or at the end of an interim storage period?

Raw notes from 100 Area reactors discussion

Group 1 – Facilitator - Gariann Gelston

What is hazard, especially N reactor? EIS ROD driver is Co-60 now and C-14 in 75 years. Chemical hazard taken care of in Interim Safe Storage (ISS) process.

What can we learn in 75 years about hazard and technology? EIS technology based on transporter that already exists – space shuttle.

Use only present assumptions, i.e., 100 Area done in 2012? 5 Year Reviews but need ongoing routine discussions.

What are the details of Cocooning?

Funding now vs. later – may not get funding in 75 years.

Should B reactor be separate discussion? Can we deal with first?

What are the cost estimates of alternatives? In EIS, based on 1989 dollars and order of magnitude, approximately $2M per rector for Transport only. Need to include all costs. Yes, but 3 cores already in ISS – 5 by end of 2005. Capping in place order of magnitude in EIS was $5M.

What new technology in 5 year horizon? Don't discount what appears to be science fiction today. Agree open to look at all technologies that arise.

Is technology development possible for lifts – what are other industries doing now?

Does ISS interfere with cleanup? No, basins gone when ISS complete.

What is gained in reducing worker and environmental risk by waiting?

Who is responsible for cores – DOE, EM, LM? What about in long term, in approximately 75 years?

Does Technology Development get better or does cost decrease over time so that it makes sense to wait? Assumption based on DOE analysis is ISS 75 year storage is safe.

What are pros and cons in moving now? Core is gone from current site. May cost less to do now, but not known given higher worker risk, worker cost could be higher.

What are uncertainties – failure modes? Earthquake, fire, flood evaluated. EIS bounding analysis is airplane impact with fire.

What was impact, what are details? No release.

For ISS what is basis of design; what failure modes? How long can it be used? 75 years design life and same failure modes as EIS.

B Reactor

B Reactor not on ISS Path now? Correct.

DOE is not in museum business, who will step forward, when and how much money will be needed?

Same risks apply to B Reactor as ISS Cores? If yes, makes sense to keep as is.

Can something be done to make B Reactor safer?

Does everyone support B Reactor Museum? Yes!! But, need to address safety.

B Reactor basin hazards?

DOE timeframe for decision should await outcome of pending legislation – do not cocoon before.

What is historical benefit of keeping B Reactor? Significant. Some areas in Reactor may need cleanup.

If B Reactor configuration is safe, does it mean the rest are safe? Depends on O&M.

Others are different? Only metal roof.

What is potential airborne release?

Terrorist; internal threats. All Reactors face same threat. Needs analysis.

Options

Bury where they are.

Need to move away from River. Takes approximately 2.5 years to move. Same time for mound in place.

Move to 200 Area and consolidate.

DOI may not be able to take land with Reactor Core.

Institutional Controls improved moving to engineered/central location.

Unrealistic to move now. Needs funding.

Decision needs to be based on value of the land, worker risk and cost.

5 Year Review, with Technology evaluation to see if can be moved before 75 years.

Dismantle B Reactor and disposition core but move building to Museum location.

Group 2 – Facilitator – Doug Houston

What is being moved? Graphite, under support base, but not biological shield.

Deterioration over 75 years? None expected.

11 mile road through desert has impacts – need to dismantle. Worker riskd need to be balanced against Ecological risk.

75 years makes sense, Co-60 gone and C-14 left.

Moving as block now is not good idea. Technology Development will improve the move – revisit later.

Does block "crumble" after 75 years?

Will other land uses away from River have limiting effect on move in 75 years?

Is there a structural hazard over 75 years? Plane crash scenario; Dam break.

Having other Reactors along River is not an eyesore – perhaps serve as monument.

Can we leave in ISS for 200 years? What is lifespan? 6 feet thick concrete walls. If left in place "forever" needs some improvement.

Impact on aesthetics, e.g., "viewshed". Expectation already is to move them.

Is B Reactor really subject to a 2005/2006 decision. B/C final configuration recommendation. 2012 done in 100 Area.

Is moving now a higher priority than other work? [Dennis Faulk rough guesstimate only today] $22M each for ISS and $30M each to move.

What is perception of risk? Low.

Not good idea to move now, but should eventually move.

What is impact of road construction/removal if moved as block? Roads for move, perhaps 50-60 miles total.

Is B Reactor Museum/Preservation Important? Yes by consensus.

What is the different from Submarine Reactor transport? Smaller core, roads exist.

Can B Reactor take a different Alternative and Milestone? Currently not in EIS.

What is the B Reactor "decision" and who makes?

Significant number of group thought Reactor Cores could stay for now. Can consider in future before 75 years. Technology Development, e.g., move technology. If move in single piece - does not seem like good idea.

Can money be set aside now for future disposition?

Group 3 – Facilitator – Susan Leckband

Does plan assume no under Reactor contamination? All Basins removed for the 5 ISS'd Reactors. Not expected to be contaminated under Reactor.

C-14 release during move? Estimated 10,000 curies C-14 and 1 curie C0-60 left after 75 years. 94 % tied up in the graphite matrix. 4% of total Co-60 and C-14 there now.

Need substantial road – 11+ miles.

Data on worker exposure? EIS estimates 10x more for dismantle over 1 piece move. Public exposure no difference. Industrial risk higher for dismantle.

Roof design life is 75 years. Concrete won't degrade in 75 years.

What is in-situ decommissioning concept? Remove roof, fill with grout or soil, cover.

Acceptance of leaving on River?

Options

Will other options need new EIS? If yes, simpler to do current plan – remove. Says "Up to" 75 years – should be removed.

Timing should coincide with closure when DOE leaves. Say 2035 (9 half-lives for Co-60) not 2061.

How long does ISS last? 75 years.

Didn't all old Reactors have tube failures into the graphite?

If Reactors left in ISS in 2012 what happens next? Allow decay, but move ~~when~~ before DOE leaves.

Do ROD amendment and consider input. Current ROD OK?

Entomb as in EIS.

Does C-14 release cause problem in moving?

Is risk to public acceptable to leave?

B Reactor

B Reactor Museum will attract visitors. Need funding. Must have restrictions.

B Reactor Museum – approx. 75 % yes, 25% no for group.

No, probably not a draw.

Remove Core and move important items to Highway area.

Impact on Refuge must be considered.

[OK if] Balanced presentation.

Depends on hazards. Any studies, engineering evaluation?

Cost to maintain? Roof replacement; restrictions; upgrades.

Risks? Safe now, approximately 10 years life for roof.

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River pipelines, groundwater and riparian zone

- Question for discussion:
  - Are the remedies completed at waste sites in the 100 Area sufficient to be considered final remedies?
  - Should the pipelines from the reactors into and under the Columbia River be removed or should they be left in place?
  - Groundwater in the 100 Area is expected to meet applicable standards by the end of the cleanup mission with the exception of the strontium-90 (Sr-90) plume at 100 N. Is it acceptable to rely on radioactive decay to remediate this plume or are extensive efforts required to perform further treatment?

For questions or comments, please send a message to RBES@rl.gov
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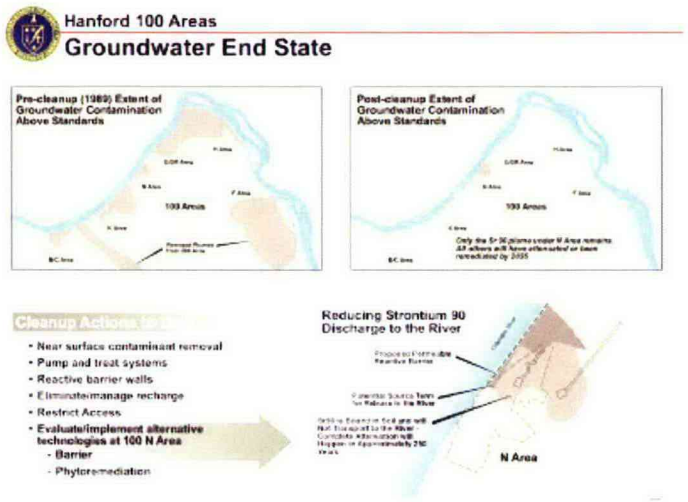
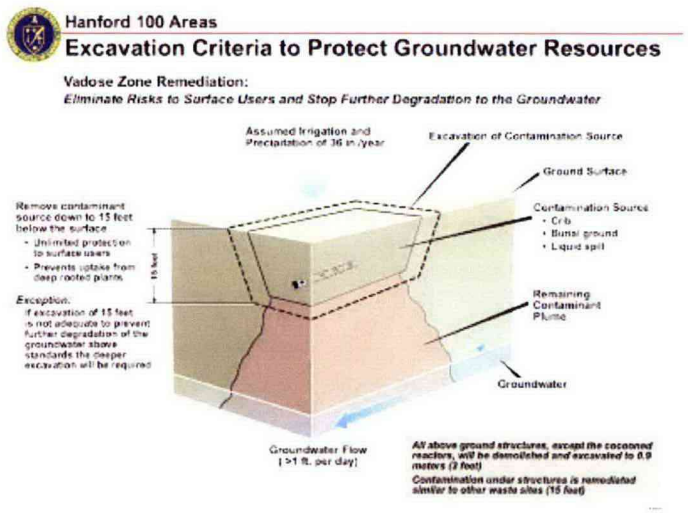


- Hanford 100 Areas - Excavation Criteria to Protect Groundwater Resources



- Hanford 100 Areas - River Pipeline End State Alternatives

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Last Updated: 07/19/2010 13:54:32

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100 Area River Breakout
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The following is the overall summary developed by the entire group

Strontium -90 (Sr-90)

•Split in opinions

—If the risk is as low as described and treatment as ineffective - spend the dollars on other cleanup needs

—Others would like to see more pristine cleanup

—Need to see the engineering evaluation

Interim Action Waste Site Cleanup

•Acceptable as final remedy

•Need the safety net of continued monitoring and 5 year review

—If this process indicates remedy inadequate to protect groundwater – need a commitment to take action (automatic trigger)

Pipelines in River

•Remove the trash from the river

•Unless outweighed by worker risk and ecological damage during removal

•If left in place - stabilize to minimized physical hazard in long term

Overall

•Need to provide a good presentation on the decisions

–The science to support the decision

–The risk associated with the options

–The engineering incorporated in solution

•Some concern with the strength of the science, need to validate with monitoring

•Tribal members pointed out the need for Government-to-Government discussions on these topics

•Tri-Parties need to explain risks from contaminants and risks associated with engineering options

100 Area End State Workshop, June 23 – 24
100 Area River Breakout
Questions:

- **Are the remedies completed at waste sites in the 100 Area sufficient to be considered final remedies?**
- **Should the pipelines from the reactors into and under the Columbia River be removed or should they be left in place?**
- **Groundwater in the 100 Area is expected to meet applicable standards by the end of the cleanup mission with the exception of the strontium-90 (Sr-90) plume at 100 N. Is it acceptable to rely on radioactive decay to remediate this plume or are extensive efforts required to perform further treatment?**

Raw notes from 100 Area River Breakout

Group 1 – Facilitator Susan Leckband

Strong interest in protecting salmon

Washington is requiring riprap to be removed in salmon spawning areas

People will be using the shoreline (they are now)

Has the full excavation of the N Area strontium contamination has been studied. Is the study available?

Can the pipelines into the river be filled with grout?

Have you considered flushing the Sr-90 into the river to restore the aquifer?

If you try to remove the pipelines from the river - environmental groups will work hard to stop you because of damage to fish habitat.

Anything but leaving them in place doesn't make sense

Anticipate hunting and fishing along the reach in the future (unlimited use)
Overnight camping

How are these uses currently restricted – how much more cleanup needs to be done to allow all desired uses

Concern about uranium in clam shells and contaminants in tules – Tribal staff indicated that Tribes want unrestricted ability to use shoreline and resources

There is a concern about movement of invertebrates into groundwater and back into river carrying contaminants and making them accessible.

Concern about DOE's enduring presence to ensure that people are not exposed to contaminants (like at N Springs)

Challenge the assumption that pipe removal will lead to destruction of spawning grounds – the river has a rocky bottom in those areas.

These discussions also need to be held at a management level with the Tribes – No one was here who could speak for the Tribes

Just putting up signs and installing riprap will not be sufficient to protect people and the ecology

Societal pressures in the future will change the end uses

Tribal staff identified anticipated activities for Tribes – setting up summer camps, teepees, sweat lodges using groundwater, erecting fish drying racks, fishing

Tribal staff indicated that groundwater cannot be brought on site for sweat lodges – must be obtained at the site of the sweat lodge.

Tribal staff and Tribal members indicated that the cost of remedy is not a consideration for Tribes (clean it up no matter what the cost)

Cost is an issue for taxpayers

Top 15 feet removal and model groundwater impact is a good approach for strontium plume

What really is a restriction (vs. notification that a hazard exists)?

Access pathway along river, legal and illegal camping

Development right up to the one-quarter mile line of the National Monument

Likely to be commercial development, homes excavations – exposing children to piles of contaminated dirt

Refuges attract development - digging to install swimming pools, piles of dirt taken for other uses.

Residential and commercial uses near the refuge at end of cleanup

Expect very little development - expect Fish and Wildlife to take control of the area limited use – conservation/preservation

Away from rivers edge (say one quarter mile) should be orchards and farming

Federal government does trade property for other uses

If 5 story buildings are constructed it will take a deeper excavation that 15 feet

N springs rip rap attracts small mouthy bass and create an attractive nuisance for fishermen who know and fish this site.

Would like to see the 100 Areas preserved for recreation. This will require construction of some amenities for folks to use such as restaurants, campgrounds etc.

Recreational and Tribal use – not residential

Both B Reactor Area and campsites/access areas within the Monument will reasonably be expected to have

- Excavations to build services such as food leading to exposure scenarios from excavated dirt
- Irrigation for grass
- Use of groundwater for pools sprinklers drinking

Group 2 - Facilitator Gariann Gelston

Strontium 90 (Sr-90) plume

How sound is the science?

How well do you know how much Sr-90 will enter the river? (How good is the modeling?) (Cost/benefit decisions)

If you leave the Sr-90 in place how do you protect the public? Could an exclusion zone be enforced for 300 years?

What about outside factors we cannot control (Blackrock Canyon Dam was an example – But I believe the intent was a whole range of actions taken by others adjacent to the site or elsewhere in the region that we cannot know at this time)

SR-90 –

Like the idea of the penetrable barrier

Seems like low risk – do nothing but deter intrusion

Do nothing unless risk is shown to be significant through science

Review periodically (required)

If contamination left in place include deed restrictions

Impacts of plumes from 200 Areas needs to be considered – look at site holistically

Will monument manager take on areas with radioactive and chemical contamination remaining?

What is the life of a permeable barrier?

Waste Site Cleanup – Groundwater Protection

Need to have same protectiveness of groundwater regardless of future land use based on human and ecological risk (dose to children as baseline, meets drinking water standard)

Are there any radionuclides that will volatilize?

Group 3 – Facilitator Doug Houston

The criteria for waste site cleanup was based on a no degradation approach – it does not mean that groundwater meets the standards at this time (it does not)

How do we know that it will not degrade the groundwater – measurements, assumptions and models?

If you are excavating a waste site and are at the bottom of the hole and some contamination remains why don't you keep digging until it all has been removed?

How certain are you that the source has been removed

What is the cost/risk of active remedy vs. passive – passive meaning waiting for contamination to naturally attenuate?

100N

Why should this be different than how we treat a gas station clean up? All contamination is not removed beneath the gas station – just enough to meet some criteria.

Money needs to be put on the higher risk problems.

Activities needed to remove pipe may cause significant impact to fish habitat.

It is not just human health and ecological risk. There are other risks – public perception, risk perception.

Cap the pipes where they enter the river to reduce hazard. Grout inside and coat the outside so if they do break up and move the contamination will not spread around.

Need risk information on Tribal fishermen, Tribal lifestyles to communicate with Tribal organizations.

Consider in the decision, Hanford's contribution as part of the overall river health and contamination picture (added during 6/24 discussion)

Note: Tribal members present pointed out that the Tribal members present and Tribal staff present spoke for themselves and that government-to-government consultation was required to obtain a Tribal position.

Doug's summary of the discussion:

Seems to be technically acceptable to leave pipelines in place, treat waste sites as described and leave the Sr-90. But need to continue to receive info and provide input to decision process.

Opposed to leaving trash in the river but given cost to remove and risk to workers and habitat it is OK

Concerned about physical risks if pipelines are left in the river

LESSONS LEARNED – 100 AREA END STATE WORKSHOP

Participant Comments – June 23 – 24, 2004

COMMENT MATRIX

178 comments were received from the 60+ attendees/participants of the 100 Area End States Workshop conducted in Richland June 23 and 24. The comments were solicited at the end of the workshop session (June 24).

The comments were sorted into twelve topic categories. Neither the comments nor categories are prioritized. Individuals who signed their comments were assigned a random code to reduce bias by reviewers.

The following table summarizes the number of responses within each category.

CATEGORY	COMMENTS
Participation - Demographics	33
Tribes	9
Invitation Letter	7
Meeting Format and Facilitation	43
Information Needs	43
Meeting Process	9
200 Area / Future Workshops	3
Agency Participation	6
Use of Input	5
Meeting Logistics - Facility	7
Meeting Logistics - Hospitality	4
Additional Comments	12
TOTAL	181*

** In three instances, comments were included in more than one category.*

Although the response to the workshop was generally favorable with respect to format, presenters, and information presented, there was considerable concern expressed about increasing public awareness and participation and making handouts and technical information more readily available prior to the workshops. (The Internet [web site] was indicated as an acceptable if not preferred media for information display prior to the workshops.) Concern was also expressed about clearly articulating/communicating expectations of the workshops and end use of the input from the public. Workshop planning and facilitation received numerous positive comments.

LESSONS LEARNED – 100 AREA END-STATES WORKSHOP

Participant Comments – June 23 – 24, 2004

PARTICIPATION – DEMOGRAPHICS

1. Need to attract a broader slice of the public – evening meetings would help

TRIBES

2. Encourage tribal participation, Each Tribe is separate, this does not replace Government to Government consultation for the Tribes.
3. These presentations should be given to Tribal governments at the board level. The Tribal government is not part of the "public" level of discussion. For example, if Office of Legacy Management gains responsibility of the land and the Tribes desires it, these discussions are mute [sic].
4. I was uncomfortable with the strong emphasis that seemed to be given to Tribal Nations demands and desires, which sounded to me like an attempt to discredit and exclude all other members of the public.

INVITATION LETTER

5. Letter on workshop did not accurately represent the purpose.

MEETING FORMAT AND FACILITATION

6. Generally positive – lots of suggestions for improvement

INFORMATION NEEDS

7. Make all materials presented available ahead of time and in hard copy during session.
8. Point the public to the huge amount of info available about the Hanford Site prior to the workshop!
9. The agenda should include the focused questions.

MEETING PROCESS

10. Provide more time for first session to take time to get to know the group.
11. The goal seemed more to provide the end vision for the Hanford Site. Many assumptions are embedded in the presentations and they should be brought out.
12. Asking for public opinion on technical decisions when analysis is not complete is unwise.
13. Good to hear both sides of each presentation, pro-con (to make informed decision).
14. More time could be given on how technical material was derived.

15. Lost questions and focus on input to reasonably foreseeable maximum exposure scenarios. Did not even explain them and how they differ from land-use, end-state.

16. Kept trying to inappropriately get comments on final engineering or institutional control (i.e. take out pipeline, leave reactors) without any risk basis for discussion & failure to have people at front who understood wrong emphasis.

17. Tell the group ahead of time whether the comments are final or not, i.e., we'll get another swipe at it with the CERCLA process, ROD process, therefore your thinking is 'possibility thinking' How would you like to see it?

200 AREA / FUTURE WORKSHOPS

18. The 200 Area will be geometrically more complex. Make sure the representation in the shaping committee of this workshop is diverse.

19. Characterize questions for 200A – narrow to upcoming decisions and use future workshops to expand.

20. Where is the 400 Area? We have/will discuss 100, 200 & 300 Areas.

AGENCY PARTICIPATION

21. TPA agencies involvement was imperative for credibility.

22. Provide list of key decisions makers for Tri-Parties.

23. Good general introduction, good specific explanations in each session, good representation from agencies and USFW.

24. Agency reps often seemed to dominate discussion and distillation of results so their views were (perhaps inaccurately) represented as the public (generally interpretable as citizen outside the process) view.

25. Agency roles, authorities, responsibilities, accountabilities were not framed at the beginning of the meeting.

26. Appreciated F&WL presentation/presence.

USE OF INPUT

27. Not clear how input will be used

MEETING LOGISTICS – FACILITY

28. Need cooler rooms – better snacks